C 99/3/draft

draft general management plan
draft environmental impact statement

BIG CYPRESS

NATIONAL PRESERVE/FLORIDA

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UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DRAFT GENERAL MANAGEMENT PLAN
and
DRAFT ENVIRONMENTAL IMPACT STATEMENT

BIG CYPRESS NATIONAL PRESERVE
Collier, Monroe, and Dade Counties, Florida

The proposed action and three alternatives for the general management of Big Cypress National Preserve are presented in this document, and the environmental consequences of their implementation are analyzed. The proposed action would establish a 40-day general gun season with full-season quota permits in all units except Deep Lake (bow hunting only) and would permit hunting with dogs under certain restrictions only in three units. Off-road vehicle (ORV) use would be allowed with certain restrictions in all units except Loop and Deep Lake. The interpretive program would be expanded, and recreational opportunities would be developed for canoeing, hiking, camping, and picnicking. Two canals would be rehabilitated to restore more natural surface water flows. Oil and gas exploration and development would be permitted to influence no more than 10 percent of the preserve at any one time. Eleven important resource areas would be protected, including superior natural resource areas, areas essential for maintaining water flow and quality, habitat necessary for the survival of threatened or endangered plant or animal species, and native American cultural sites or important historic or archeological resources. Wildlife programs would be expanded to protect species listed by the federal and state governments, and to improve habitat for white-tailed deer. Feral hogs would be eliminated unless they were determined to be suitable prey for the Florida panther. Exotic plants and animals would be selectively controlled. All sites on or eligible for listing on the National Register of Historic Places would be protected, as would significant native American sites. Miccosukee and Seminole Indians would continue their usual and customary use and occupancy of federal lands within the preserve, subject to reasonable regulations to be developed with the assistance of these groups and other interested parties. With respect to environmental consequences, the proposed action would restore more natural surface water flows to approximately 38,000 acres, would ensure the protection of important resource areas, and would moderately improve the numbers and health of the Florida panther population. The number of hunters and total ORV recreational users would probably decrease. More interpretive and recreational opportunities would be provided for the general public. Proposed actions could inconvenience private property owners. Oil and gas owners, lessees, and operators could be affected if their proposed oil and gas activities would influence more than 10 percent of the preserve, potentially delaying additional development. The other alternatives include continuing management policies as of 1985-86 (status quo alternative), providing regional recreational opportunities (alternative A), and emphasizing the preservation of both natural and cultural resources and allowing limited recreational opportunities (alternative B). The status quo alternative would provide the least protection of important resource areas, would have no effect on existing hunting and ORV use patterns, would provide few interpretive and recreational opportunities for general visitors, and would result in no additional constraints on oil and gas owners, lessees, and operators. Alternative A would provide moderate protection of important resource areas; hunters and ORV users would be subject to moderate restrictions compared to the present situation; and general visitors would be offered more recreational and interpretive opportunities. Actions could inconvenience private property owners. Oil and gas interests under alternative A could be affected by limiting the influence of exploratory and development activities to no more than 10 percent of the preserve. Alternative B would provide the greatest level of protection for important resource areas, a potential decrease in hunting by up to 75 percent, a decrease in ORV trails and use of ORVs for hunting, a limited increase in interpretive and recreational opportunities for general visitors, inconvenience to private property owners, and severe restrictions on oil and gas interests because of lack of access to most oil and gas resources.

The review period for this document ends December 1, 1989. All comments must be received by that time and should be addressed to:

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SUMMARY

The purpose of a general management plan is to guide visitor use, natural and cultural resource management, and general development within the original boundary of Big Cypress National Preserve for the next 10 to 15 years. The *Draft General Management Plan / Draft Environmental Impact Statement* for the preserve identifies important resources, management issues, alternative strategies to address the issues, and the potential environmental consequences of implementing those alternatives. (These topics will be addressed for the 146,000 acres added to the preserve in 1988 in a later addendum to the general management plan.)

THE PROPOSED ACTION (DRAFT GENERAL MANAGEMENT PLAN) AND ALTERNATIVES

A proposed action (draft plan) and three alternatives are being considered. The overall direction of the proposed action is to establish reasonable regulation of most existing uses and to provide diverse recreational opportunities.

The proposed action would establish an interpretive program at the preserve, including six self-guiding walks and several new wayside exhibits. Other visitor services would include two designated canoe trails, six primitive frontcountry campgrounds, 50 backcountry shelters, new picnic facilities at Oasis, and concessioner visitor services and ORV storage. Backcountry camping would be allowed throughout the Turner River and Loop units and would be permitted at designated sites in the Bear Island, Deep Lake, Corn Dance, and Stairsteps units. NPS administrative and residential facilities would continue to be centered at Ochopee and Oasis.

Future hunting regulations would propose a 40-day general gun season, with a full-season quota on hunting permits. Hunting with dogs for birds and small game, white-tailed deer, and feral hogs would be permitted in the Turner River unit, and only bird dogs would be permitted in the Corn Dance and Bear Island units. The Loop unit would continue to be a walk-in hunting area. The Deep Lake unit would be converted to a walk-in area and would be reserved for bow hunting. Some kind of hunting would be permitted a total of 140 days per year.

A total of 37 off-road vehicle (ORV) access points would be provided, and specific ORV trails would be designated in the Bear Island and Corn Dance units; in the Turner River and Stairsteps units ORV use would be dispersed by designating both trails and use areas. New regulations would be promulgated to address specific ORV use, vehicle types, and area restrictions. Under these regulations only airboats would be permitted in marshlands south and east of Gator Hook Strand in the Stairsteps unit. As at present, no ORVs would be allowed in the Loop unit, and the Deep Lake unit would also be closed to ORVs. As many as 2,500 ORV permits would be issued annually. Tracked vehicles would be prohibited in the preserve.

Under the proposed action, natural resource management would emphasize the restoration of hydrological regimes by mitigating artificial obstructions and diversions affecting the Turner River and Deep Lake Strand, improving flows under the Loop Road and through Paces Dike, and other projects. The use of prescribed fire would be expanded to better manage vegetation and wildlife habitat, as well as to reduce hazardous fuel accumulations. Special management actions would be taken to protect species listed by federal and state law as endangered or threatened, particularly the Florida panther, Cape Sable seaside sparrow, red-cockaded woodpecker, bald eagle, and *Liguus* tree snails. Monitoring, research, habitat management, and hunting regulations would be expanded to better manage white-tailed deer as a native ungulate, a popular game species, and the primary prey of the endangered Florida panther. Feral hogs would be managed as the secondary prey in areas where they may be important to the Florida panther; they would be eliminated or controlled as an exotic species elsewhere.

All prehistoric and historic archeological sites (395 are currently known) would be evaluated by the National Park Service and the Florida state historic preservation officer to determine their eligibility for listing on the National Register of Historic Places. Those sites considered to be eligible would be actively managed for protection against vandalism, exotic plants and animals, fire, erosion, or other destructive forces. The National Park Service would work to establish and promote good relations with Miccosukee and Seminole people who reside in the preserve or use its resources. In consultation with tribal groups and other interested parties, reasonable regulations to govern the usual and customary use and occupancy of the preserve would be promulgated. Research and documentation would be conducted to preserve native American ethnographic resources.

Oil and gas geophysical and production operations would be managed so that no more than 10 percent of the preserve would be influenced by these activities at any one time. Regulated geophysical exploration would be allowed in all units. Surface occupancy for exploratory drilling and production would be permitted outside of vegetation communities and cultural sites identified as important resource areas. In the Bear Island unit drilling and production activities would only be permitted from existing roads and pads. Plans of operations would be reviewed on a case-by-case basis to ensure compliance with the preserve's establishing legislation (Public Law 93-440). Site-specific mitigating actions for oil and gas development would be guided by a minerals management plan (a draft plan is included as appendix C) and by a plan of operations for each project.

Of the three alternatives considered in addition to the proposed action, the status quo alternative would continue existing programs, development, and trends as of 1985-86. Alternative A would provide a level of management intermediate between the status quo alternative and the proposed action and would involve the greatest amount of facility development. Conversely, alternative B would provide the least development and the most conservative management of all. Table 18 in the text provides a comparison of actions under the proposed action and each alternative.

ENVIRONMENTAL CONSEQUENCES

Twenty impact topics have been selected to analyze the potential consequences of the proposed action and each alternative. Impact topics include surface water flows and water quality, six important resource area vegetation types, six wildlife species, air quality, cultural resources, and five user groups.

Implementation of the proposed action would better protect the preserve's natural and cultural resources, while providing for more appropriate recreation and reasonable regulation of consumptive uses, than would either the status quo alternative or alternative A. Alternative B would add further protection of natural and cultural resources, but it would provide less opportunity for recreation. A detailed summary of the impacts of the proposed action and alternatives is shown in table 19.

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PURPOSE OF AND NEED FOR A PLAN

INTRODUCTION

The purpose of a general management plan for Big Cypress National Preserve is to guide visitor use, natural and cultural resource management, and general development for the next 10 to 15 years. The plan will be the National Park Service's statement of intent with regard to managing the area's resources, providing for legislatively authorized uses, and allowing for appropriate visitor use and interpretation of the resources.

The plan is needed to address problems and management concerns at the preserve that are related to visitor use (including hunting, off-road vehicle [ORV] driving, and on-site interpretive programs), the protection of federal and state listed plants and animals, and the preservation of important natural and cultural resource values (for example, the hydrological regime, critical vegetation types, and archeological sites). To address these issues, the plan needs to determine which lands are available for public use and which lands are open to oil and gas activity.

This *Draft General Management Plan / Draft Environmental Impact Statement* presents the proposed action and three alternatives for the management of Big Cypress. It also analyzes the environmental consequences of implementing them.

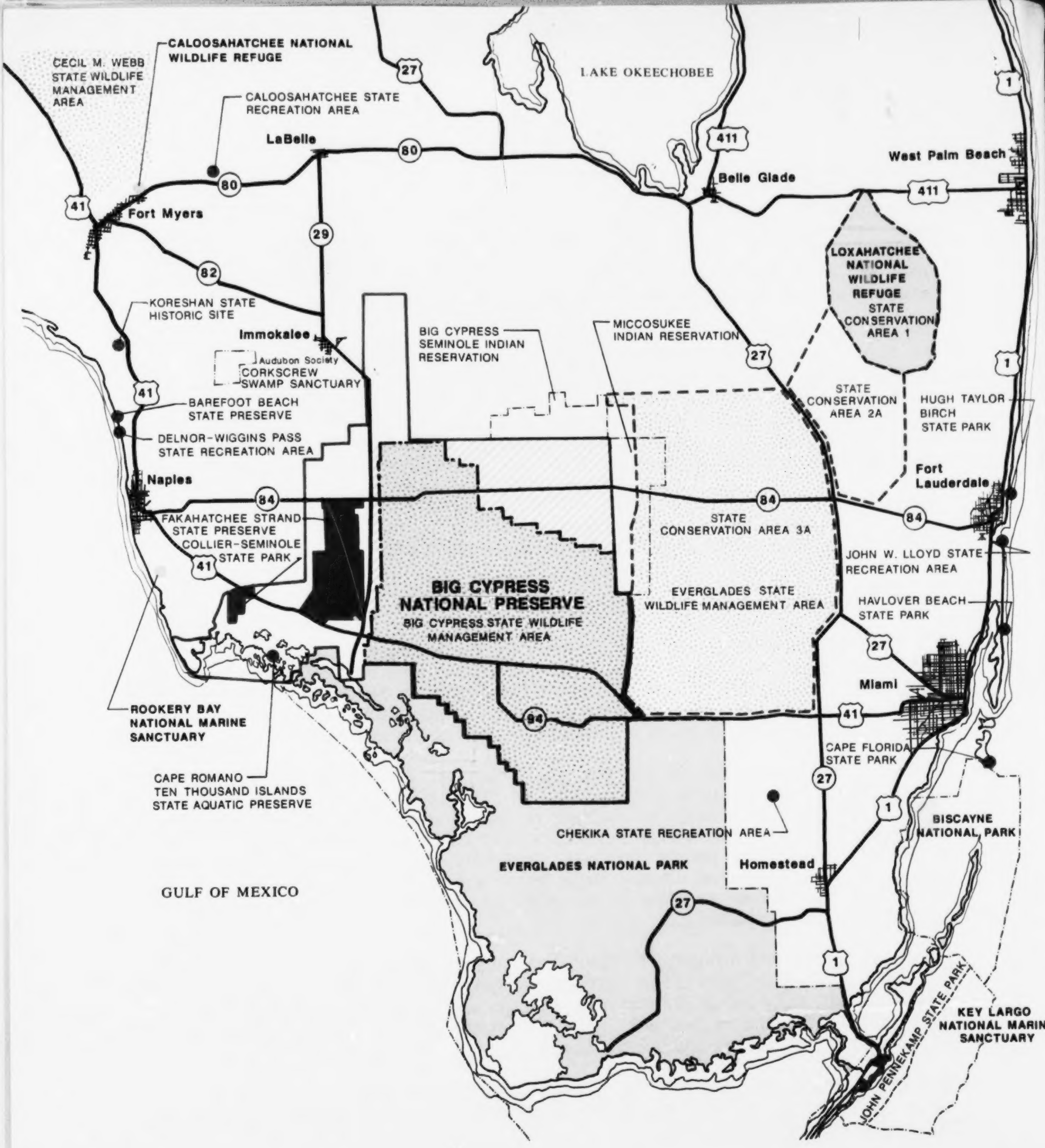
BRIEF DESCRIPTION OF THE PRESERVE

Big Cypress National Preserve is in southern Florida, centrally located between Miami and Naples (see South Florida Region map). It extends from the northern boundary of Everglades National Park to 7 miles north of Florida Highway 84. Besides Florida 84, US 41 is the other major highway across the preserve. The preserve contains 574,440 acres, and it encompasses one of the least developed watersheds in south Florida.

Visitors to Big Cypress for the first time see a flat, wet, primitive land. The area was named Big Cypress because of its extent, not because of the size of its trees, and visitors drive for miles through an expanse of open prairies dotted with cypress trees, distant pinelands, and tree islands broken at intervals by dark, forested swamps. Wildlife is abundant. Great blue herons, anhingas, kingfishers, and alligators line the roadside canals and give visitors an exciting visual focus and a feeling of wilderness. On the whole, first impressions are likely to be of an inhospitable land, with no firm ground beyond the highway shoulders.

Seasoned visitors and residents, however, see another side of Big Cypress. Sportsmen can find a variety of recreational activities, ranging from airboating to bow hunting. Naturalists can study the area's rich natural history and its delicate ecological balances. And some Miccosukee Indians who make their homes in the preserve depend on its resources for food, shelter, and spiritual needs.

For all of these people, however, Big Cypress must be experienced on its own terms. It never becomes too familiar, and getting lost, stuck, or broken down is part of the challenge of this formidable land.


CECIL M. WEBB STATE WILDLIFE MANAGEMENT AREA
CALOOSAHATCHEE NATIONAL WILDLIFE REFUGE
CALOOSAHATCHEE STATE RECREATION AREA
LAKE OKEECHOBEE
27
1
411
LaBelle
80
West Palm Beach
Belle Glade
411
41
Fort Myers
29
82
LOXAHATCHEE NATIONAL WILDLIFE REFUGE
STATE CONSERVATION AREA 1
KORESHAN STATE HISTORIC SITE
Immokalee
Audubon Society CORKSCREW SWAMP SANCTUARY
BIG CYPRESS SEMINOLE INDIAN RESERVATION
MICCOSUKEE INDIAN RESERVATION
27
1
41
BAREFOOT BEACH STATE PRESERVE
DELNOR-WIGGINS PASS STATE RECREATION AREA
STATE CONSERVATION AREA 2A
HUGH TAYLOR BIRCH STATE PARK
Naples
84
84
Fort Lauderdale
84
FAKAHATCHEE STRAND STATE PRESERVE
COLLIER-SEMINOLE STATE PARK
STATE CONSERVATION AREA 3A
JOHN W. LLOYD STATE RECREATION AREA
41
BIG CYPRESS NATIONAL PRESERVE
BIG CYPRESS STATE WILDLIFE MANAGEMENT AREA
EVERGLADES STATE WILDLIFE MANAGEMENT AREA
HAVLOVER BEACH STATE PARK
27
Miami
94
41
ROOKERY BAY NATIONAL MARINE SANCTUARY
CAPE FLORIDA STATE PARK
CAPE ROMANO TEN THOUSAND ISLANDS STATE AQUATIC PRESERVE
27
1
BISCAYNE NATIONAL PARK
CHEKIKA STATE RECREATION AREA
EVERGLADES NATIONAL PARK
Homestead
GULF OF MEXICO
27
1
JOHN PENNEKAMP STATE PARK
KEY LARGO NATIONAL MARINE SANCTUARY
Federal Land
Big Cypress National Preserve Addition
State Land
Area of State Critical Concern
State Wildlife Management Area
State Wildlife Conservation Area

SOUTH FLORIDA REGION

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176-20,003-C

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Natural Resources

Water is a principal natural resource of the entire south Florida region, and 90 percent of Big Cypress is flooded during the wet season. Because of the high annual rainfall (mean annual precipitation is 54 inches, with approximately three-fourths falling during the summer) and the flat limestone topography (a seaward slope of about 2 inches per mile), the inundation lasts for several months beyond the actual rainfall period (Duever et al. 1986a). Because the preserve is relatively undeveloped, it serves as a large natural reservoir and nutrient filter, permitting natural biological processes to nourish diverse ecological communities distinctive to south Florida. Throughout the wet season the water flows in a southwesterly direction through the estuaries of western Everglades National Park. The ecology of the preserve is finely tuned to the seasonal flow of water, and any interference can alter this sensitive subtropical habitat.

Extensive prairies and marshes, forested swamps, and shallow sloughs characterize the preserve. Hydroperiod, the amount of time each year that soils are saturated, is the major determinant of vegetative communities, and a difference of only a few inches in elevation subsequently changes the hydroperiod and leads to the establishment of totally different plant communities. At one time Big Cypress contained pristine cypress strands and old-growth pinelands, but by 1950 virtually all the cypress strands of commercial value and much of the pinelands within the preserve had been logged. The young cypress strands, mixed-hardwood swamps, and pinelands in the preserve today are still recovering. Big Cypress is also noted for its widespread cypress prairies – natural grasslands dotted with stunted cypress trees.

Most wildlife species native to south Florida occur within the Big Cypress watershed. Ten species are listed by the U.S. Fish and Wildlife Service as threatened or endangered, and an additional 26 species are listed by the state of Florida as rare, threatened, or endangered. One of Florida's most endangered animals is the Florida panther (*Felis concolor coryi*), and it is the subject of an intensive recovery effort in the preserve and the surrounding region.

Cultural Resources

Archeological surveys within the preserve have located 395 sites, including black earth middens, sand mounds, transient camps, and rock accumulations. Some sites date back to as early as 500 B.C. (the Glades I period). Six sites have been placed on the National Register of Historic Places, and 12 are potentially eligible for listing. No historic structures in the preserve are listed on the National Register. The Monroe station on US 41 was evaluated by the National Park Service and the Florida State Historic Preservation Office, and it was found to have lost the integrity necessary for placement on the National Register.

Based on the archeological evidence, Big Cypress was used year-round in a transitory hunting and gathering pattern. Agriculture was apparently insignificant, perhaps because rich plant, fish, and animal food sources were available. Land animals and seafood were the primary sources of protein. The Big Cypress culture was not as highly developed as other cultures in the Southeast, possibly because people relied on wild food sources rather than cultivating crops, and the foods, especially shellfish, were not easily preserved and stored for later use. Consequently, only a few large, relatively permanent settlements have been identified.

Today Seminole and Miccosukee Indians depend on the preserve as a source of natural materials for housing, crafts, and other cultural and religious uses.

Development and Use

South Florida has been the site of oil exploration since 1930. The first production well was drilled in 1943 immediately northwest of the preserve on the Sunniland trend, a productive oil and gas area that crosses the northern part of the preserve. Subsequent discoveries have followed a northwest-southeast orientation along the northern and eastern boundaries of the preserve, terminating at the northern boundary of Everglades National Park. Bear Island and Raccoon Point are the two major producing oil fields in the preserve. The relatively recent discoveries of oil and gas both within and adjacent to the preserve have prompted an increasing interest in additional testing, including geophysical exploration as well as exploratory drilling. Most mineral rights and subsurface estates remain with the respective private or state interests.

Recreational activities in the preserve include hunting, ORV driving, fishing, camping, and hiking. White-tailed deer and feral hogs are the most popular large game animals, and hunters are the primary users of ORVs. Fishing is popular in borrow canals along major roads, and the canals are also prime locations for wildlife viewing. Campgrounds and undeveloped campsites are used mainly by hunters and winter visitors. The principal hiking trail in the preserve is the Florida National Scenic Trail, which terminates at the Oasis ranger station.

NPS development in the preserve includes the Oasis ranger station on US 41 in the middle of the preserve and the administrative headquarters on US 41 at Ochopee. Oasis serves as the primary maintenance/operations center for the preserve. Housing is primarily at Ochopee.

The major tracts of nonfederal public land in the preserve are owned by the Florida State School Board and the Dade County Port Authority, which operates the Dade-Collier Training Airport (known as the Jetport). Some 200 small, privately owned parcels scattered throughout the preserve are classified as improved properties and are exempt from acquisition unless owners are willing to sell or the land is threatened with uses that could be detrimental to the purposes of the preserve.

LEGISLATIVE MANDATES

Big Cypress National Preserve was established in 1974 by Public Law 93-440 for the purpose of ensuring "the preservation, conservation and protection of the natural, scenic, hydrologic, floral and faunal, and recreational values of the Big Cypress Watershed in the State of Florida and to provide for the enhancement and public enjoyment thereof" (see appendix A).

The legislation and its history, as they relate to this general management plan, are discussed below.

Legislative Background

A review of the House and Senate reports leading to passage of PL 93-440 identifies two fundamental resources in the preserve:

> ***Water*** – The natural flow of freshwater (that is, the watershed) is key to the survival of Everglades National Park as well as the integrity of the entire south Florida ecosystem.
>
> ***Natural values*** – As important as the watershed, the natural, scenic, floral, and faunal values are cited as being worthy of national recognition and protection on their own merit. Recreation is discussed along with the natural values because the natural resources provide opportunities for recreational pursuits.

The act states that the preserve, as a unit of the national park system, is to be administered in a manner that will ensure its "natural and ecological integrity in perpetuity."

Use and Restrictions

The act and its legislative history identify the following six categories of use that are allowed within the preserve (subject to reasonable regulation):

uses associated with "improved properties"
exercise of rights associated with oil and gas
hunting
fishing
trapping
certain Indian rights

The act further directs that rules and regulations necessary and appropriate to limit or control the following uses be developed:

motorized vehicles
exploration for and extraction of oil, gas, and other minerals
grazing
the draining or constructing of works or structures that alter natural watercourses
agriculture
hunting, fishing, and trapping
new construction
such other uses as may need to be limited or controlled

The act gives specific guidelines regarding the development of rules and regulations for hunting, fishing, trapping, and entry, as stated below:

> The Secretary shall permit hunting, fishing, and trapping on lands and waters under his jurisdiction within the preserve in accordance with the applicable laws of the United States and the State of Florida, except that he may designate zones where and periods when no hunting, fishing, trapping, or entry may be permitted for reasons of public safety, administration, floral and faunal protection and management, or public use and enjoyment. Except in emergencies, any regulations prescribing such restrictions relating to hunting, fishing, or trapping shall be put into effect only after consultation with the appropriate State agency having jurisdiction over hunting, fishing, and trapping activities.

The Senate and House reports (S. Rept. 93-1128 and H. Rept. 93-502) also give guidance as to how ORVs are to be managed:

> While the use of all-terrain vehicles must be carefully regulated . . . to protect the natural, wildlife and wilderness values of the Preserve, the bill does not prohibit their use along designated roads and trails.

Furthermore, the act permits the Miccosukee Tribe of Indians of Florida and members of the Seminole Tribe of Florida,

> subject to reasonable regulations, . . . to continue their usual and customary use and occupancy . . . including hunting, fishing, and trapping on a subsistence basis and traditional tribal ceremonies.

Planning Function

PL 93-440 and its historical record give direction as to how the preserve is to be managed. The record is clear on which uses should be allowed, and under what conditions they should be regulated or restricted. It is the function of the general management plan to identify, within these legislative parameters, reasonable use and development alternatives to ensure adequate protection of the resource values that caused Big Cypress to be included in the national park system while also allowing compatible public use and enjoyment.

The legislative history acknowledges the state's cooperation in preserving the Big Cypress area. In addition to the direction found in the act, the plan must be in compliance with all other applicable federal and state statutes and regulations. Consideration will be given to the protection of historic objects and archeological resources (National Historic Preservation Act and Archeological Resources Protection Act), floodplains and wetlands (Executive Orders 11988 and 11990), coastal zone management (Coastal Zone Management Act and the Florida coastal zone management program), and air and water quality (Clean Air Act and the Federal Water Pollution Control Act). The Endangered Species Act is particularly important at Big Cypress, where 35 native species are listed as endangered or threatened, or are candidates for federal listing. The Endangered Species Act directs the National Park Service, as well as all other federal agencies, to use its authorities to further the purposes of the act by carrying out programs for the conservation of listed species (16 USC 1536[a][1]).

PLANNING ISSUES AND MANAGEMENT CONCERNS

Planning issues and management concerns that are addressed in this document were identified through meetings with concerned governmental agencies and the public (for additional information see the "Consultation and Coordination" section). To a large extent, the primitive character and biological richness of Big Cypress are due to its relative inaccessibility. However, this is changing with increasing highway construction, oil and gas development, and the growth of urban areas in south Florida. The central problem at Big Cypress is how to provide for equitable access and visitor use without impairing limited natural and cultural resources or the beneficial experiences they provide. The issues and concerns that are related to this problem are described below.

VISITOR USE ISSUES

Interpretation and Support Facilities

Few services are currently provided for the general public in Big Cypress. Most use is by hunters, fishermen, ORV users, and owners of improved properties. Means of public access to the backcountry are limited, and there are few opportunities for general visitors to learn about and appreciate the unique resources found in Big Cypress.

Hunting

Hunting, together with off-road vehicle (ORV) use, is the most popular activity in the preserve. The major game species are white-tailed deer and European feral hogs. These species, however, are also important prey for the endangered Florida panther. Management of hunting is critical to the management of deer and hog populations and the success of panther protection programs.

There are concerns about the ability of the preserve's resources to sustain present levels of hunting. Also fluctuating staffing levels at check stations and varying survey strategies have not produced adequate information about deer and hog harvest rates within the preserve. Without reliable information about the number of hunters and their success rates, it is more difficult to establish hunting regulations that will ensure a quality experience for hunters and the least adverse effects on the preserve's natural resources.

Off-Road Vehicle Use

Currently ORVs can access the preserve at almost any location, and they are free to travel almost anywhere, with ORV trails crisscrossing much of the preserve. Only the Loop unit, the Eleven Mile Road, and the Florida National Scenic Trail are closed to ORV use. During the 1986-87 season the National Park Service issued 1,627 permits for ORVs. Vehicle types include traditional swamp buggies and also the smaller, more mobile all-terrain vehicles (ATVs), which in 1984 accounted for 60 percent of the total registration and are capable of entering previously inaccessible areas. Hunters are the primary users of ORVs, and because of the proliferation of ATVS, the Florida Game and Fresh Water Fish Commission in 1985 prohibited the use of ATVs for hunting. Unlimited ORV access and use could result in short-term and cumulative adverse impacts on the preserve's resource values, as well as lessen the quality of the visitor experience for all recreationists.

Under Executive Orders 11644 and 11989 the National Park Service is required to manage ORV use under a policy that national park system lands will be closed to such use except for those areas or trails that are suitable and specifically designated as open. Whenever it is determined that ORV use will cause or is causing considerable adverse effects on resources, the Park Service must immediately close such areas or trails until the effects have been eliminated and actions implemented to prevent future reoccurrence.

Hiking

The terminus of the Florida National Scenic Trail is at the Oasis ranger station, and a total of 42 miles of the trail are within the preserve boundary. Portions of established ORV trails were used in designating the Florida trail; consequently, conflicts between ORV users and hikers are frequent. ORV use of hiking trails also erodes the trail surface and promotes flooding, making hiking difficult.

Camping

Both frontcountry and backcountry camping are allowed in the preserve. Five primitive frontcountry campgrounds have been located on abandoned fill sites; the sites are unorganized, and the campgrounds have no sanitary facilities. This type of unregulated use creates public health and safety problems, can result in resource degradation, and is a poor quality visitor experience. Some 200 backcountry properties are classified as trespass properties, which means they do not meet the criteria for exemption from federal acquisition as listed in PL 93-440; these properties will eventually be removed, affecting opportunities for backcountry camping for both former trespass camp users and the general public.

NATURAL RESOURCE ISSUES

Hydrology

The quality, quantity, seasonality, and distribution of surface water affect all biological communities in the Big Cypress swamp and in downstream Everglades estuaries. Since development in similar south Florida environments has repeatedly illustrated the sensitivity of these communities to hydrologic perturbations, comparable developments within Big Cypress are important natural resource issues.

Canal and road construction are two categories of development that have already altered portions of the Big Cypress watershed through diversion or obstruction of natural flows.

Oil and gas development represents a major continuing natural resource management issue for the preserve. Development at Raccoon Point and in the Bear Island unit is already underway. Continued development, if improperly designed or operated, could result in degradation of the preserve's water regime and hydrologically sensitive resources.

Excessive water use could occur locally as a result of irrigating agricultural lands. The water levels at Big Cypress are critical to the ecosystem because of the relatively narrow tolerances of plant communities. Any abrupt changes in the water level regimes – even of just a few inches – could result in major changes in the ecology of the preserve.

Nutrient contamination could occur locally as a result of inadequate sanitary facilities at some visitor sites or perhaps from new agricultural development adjacent to the preserve. Recent research in similar Everglades environments has shown that even small elevations in nutrient concentrations can cause significant changes in native ecosystems.

Minerals

Exploration for and development of private oil, gas, and other minerals within the preserve is allowed under PL 93-440, subject to NPS regulation, unless the secretary of the interior determines that such uses are detrimental to the purposes of the preserve. In that event, the National Park Service would notify and petition Congress for the funds to acquire the mineral estate. Bear Island and Raccoon Point are the only actively producing oil fields in the preserve at present, but the likelihood of future developments is great, especially on the Sunniland trend. Geophysical surveys to locate and evaluate oil and gas reserves for potential development have been conducted throughout the preserve in the past and will likely take place in the future. The locations and timing of these future exploration and development operations must be weighed against the preservation of natural and cultural resources and the provision of quality visitor experiences.

Vegetation

The Big Cypress region is noted for its diversity of native plant species, which has been caused by the overlap in the distribution of temperate and tropical plants, and upwards of 1,600 species have been identified. However, the region has been invaded by numerous exotic plants, and if left unchecked, three exotic species in particular – Australian pine, Brazilian pepper, and melaleuca – could eventually occupy much of the preserve lands. Melaleuca has invaded some 60 square miles in the preserve at the expense of native species. Australian pine and Brazilian pepper have invaded disturbed sites and created screens along roads, blocking motorists' views.

Fire Management

Big Cypress National Preserve experiences the largest fire load of any unit within the national park system, both in terms of numbers of fires and often in annual expenditures for fire suppression. Fire is an integral part of the ecology of south Florida, and most plant communities are not only highly susceptible to fire but in fact depend on periodic burning for their survival.

A fire management plan has been developed that has concentrated on suppression activities and the use of prescribed fire to reduce hazardous fuel levels in high arson areas, particularly along major roads. Prescribed burning is also used to maintain pastures on lands leased for grazing and nesting habitat for the red-cockaded woodpecker and Cape Sable seaside sparrow. Even with current efforts, however, much of the preserve interior is in need of a broader application of prescribed fire to better manage natural communities. The absence of periodic fire has caused advanced plant succession, a shift in wildlife habitat, and the accumulation of hazardous fuel levels in some portions of the preserve.

Wildlife

Big Cypress has an exceptional concentration of rare and protected species. The endangered Florida panther, the Cape Sable seaside sparrow, the red-cockaded woodpecker, and the state-protected *Liguus* tree snails are of particular concern. White-tailed deer and European feral hogs are important as panther prey and as game species. Issues and management concerns about protected species, and deer and hogs, are discussed in more detail below:

> ***Protected species*** – The Florida panther is under extreme threat of extinction, and less than 30 individuals are believed to remain in the wild in south Florida. Problems affecting the panther, as cited in the *Florida Panther Revised Recovery Plan* (USFWS 1987a) are low population numbers, depressed genetic viability, increased human presence, disease and parasites, and reduced prey base.
>
> At this time there is no unified program for managing the Cape Sable seaside sparrow. Some burning for habitat has been done, but management has not been consistent. An intensive survey of sparrow habitat was conducted in 1981 (NPS, Bass and Kushlan 1982g), but there is no established monitoring program.
>
> Habitat maintenance for the red-cockaded woodpecker requires periodic burning. Monitoring and prescribed burning of known woodpecker colonies has been a continuing effort.
>
> *Liguus* tree snails are popular with collectors because of the variety of shell color patterns. Because snail populations are restricted to individual hammocks, the shell markings vary from hammock to hammock, resulting in vivid examples of genetic speciation. Snail varieties in the species *Liguus fasciatus* are listed by the state as a species of special concern. On occasion some collectors have intermingled snails of various color forms, and in some instances they have introduced varieties from other locations.
>
> ***Deer and hog management*** – White-tailed deer and European feral hogs are preyed on by panthers and sought as game by hunters. The concern is that hunting may be reducing the prey base for the panther, thus putting further stress on that already endangered species.
>
> The most controversial exotic animal in the preserve is the feral hog. As an exotic species, there are concerns that hogs could be displacing native animal species and that rooting activities could be damaging native plants and animals, along with archeological resources. However, a positive factor is that hogs are apparently an important secondary food source for panthers in areas where deer are scarce.

CULTURAL RESOURCE ISSUES

Of the 395 known archeological sites (both historic and prehistoric), many of them are on dry hammocks where there is potential for adverse impacts from oil and gas exploration, ORV use, hunters' camps, pothunters, grazing, changing water levels, exotic plants, feral hog rooting, armadillo burrowing, and vandalism. Pothunting and vandalism, along with burrowing by hogs and armadillos, appear to be the most serious threats. Pothunter vandalism has affected approximately 14 of the larger, more readily visible archeological sites, as well as Miccosukee and Seminole sites. The stratigraphy of resource sites has been changed by the roots of the exctic Brazilian pepper and Australian pine. Some damage to cultural resources may have occurred at the sites of hunting camps and inholdings because many of these same sites were historically used as habitation sites. ORV use has created erosion problems at some sites. Peat fires could cause compaction and loss or alteration of carbonized plant remains. Access roads for oil and gas development could provide easier access to remote archeological sites, increasing the risk for pothunter vandalism. If not properly sited, future oil and gas development could also affect archeological sites.

RELATED ISSUES AND CONCERNS

Relationship of the General Management Plan to Other NPS Planning Efforts and Management Actions

The final general management plan will determine the guiding management philosophy for the area within the original boundaries of Big Cypress National Preserve, and it will provide strategies for addressing issues and achieving management objectives over the life of the plan, usually 10 to 15 years. Based on those strategies, necessary developments and further actions will be identified for efficient protection, use, and operations. Following the approval of the general management plan, more detailed implementing plans, or action plans, will be developed to carry out the plan concepts.

In various sections of the *Draft General Management Plan* issues such as hunting, ORV use, and other forms of public use are addressed. The general management plan is a direction-setting document that serves as the basis for proposing management actions dealing with such issues. Once the general management plan is approved, the implementation of actions concerning hunting and ORV use will require promulgation of rules and regulations. Under this process the public will again have the opportunity to comment on specific proposals. As such the general management plan, in and of itself, does not provide the exclusive basis for the adoption of future rules and regulations.

In various sections of the *Draft General Management Plan* options are also discussed regarding the scope and nature of oil and gas exploration and development. Limitations on exploration and development are proposed for the total area of the preserve as well as significant restriction on these activities in the southern area of the preserve. In this regard the authorizing legislation and NPS acquisition strategy have focused on not acquiring mineral interests, particularly because of the costs involved. The acquisition of these interests would only be considered if the exploration or development would be detrimental to the purposes of the preserve, and thereby should not occur, even under the protection of the existing regulations. In view of the possibility that oil and gas development might have to be precluded prospectively in certain areas of the preserve, any regulatory strategy must give consideration to (1) the fact that the oil and gas is privately owned; (2) the guidance of Executive Order 12630 ("Governmental Actions and Interference with Constitutionally Protected Property Rights"); and (3) avoiding the acquisition of these interests outside of the budgetary process, for example, by inverse condemnation. Accordingly, in the event the National Park Service denies a plan of operations based on anticipated, unacceptable levels of environmental impacts resulting from the proposed operations (i.e., exploration or development), and the denial is viewed as a potential for the taking of property interests, funds will be sought immediately from Congress to acquire the affected mineral estate. If funds are not made available for the acquisition within a reasonable period of time or a reasonable accommodation cannot be worked out with the owner of the oil and gas interests, the oil and gas operations will be allowed to proceed under the NPS rules and regulations.

Public Law 100-301, the Big Cypress National Preserve Addition Act, was approved April 29, 1988, while this *Draft General Management Plan / Draft Environmental Impact Statement* was under preparation. The act authorizes the acquisition of about 146,000 acres north and west of the preserve. Because there is little resource information available about the addition lands, and because NPS access to the new lands has been limited, this draft document only applies to lands within the borders of the preserve as described in the 1974 legislation. An addendum to the general management plan will be prepared for the additional lands once sufficient resource and use data have been collected. PL 100-301 also directs the National Park Service to cooperate with the state of Florida to develop three recreation access points along I-75 within the original preserve boundary or on the new lands. The addendum will also include recommended recreation access points and associated facilities for the new lands. This document only addresses recreational access off I-75 within the original preserve boundary.

The approved general management plan will require that several action plans prepared over the last few years for Big Cypress be revised and updated. These include the 1982 *Environmental Assessment for Fire Management*, the 1982 *General Development Plan*, the 1982 *Resources Management Plan*, the 1983 Proposed Sensitive Resource Areas map, and the 1984 "Interpretive Plan." The 1984 *Land Protection Plan* (revised 1986 and 1988) discusses protection requirements for nonfederal lands or interests in lands within the original preserve boundaries; this plan will be revised to reflect the direction of the final general management plan and to respond to the 1988 expansion of the preserve boundary. The 1980 *Wilderness Recommendation* found that none of the lands within Big Cypress were suitable for wilderness at that time. The conclusions of that study are still valid.

A minerals management plan is being prepared concurrently with the draft general management plan. It focuses on specific surface protection stipulations and actions needed to protect important resource values within those areas of the original preserve open to oil and gas activity. The minerals management plan is based on preservewide and unit-specific management objectives that were developed as part of the general management planning process. It is included in appendix C.

The proposed action and all the alternatives in this document recognize and incorporate the general directions and provisions of the authorizing legislation concerning native American rights of usual and customary use and occupancy, and maximum participation in any authorized future revenue-producing visitor services in the preserve. It is the policy of the National Park Service that management actions affecting native Americans be implemented in a knowledgeable, aware, and sensitive manner. Ethnographic information about the usual and customary practices of the Miccosukees and Seminoles who use Big Cypress is lacking, as is information about potential impacts of such use on natural and cultural resources. Further consultation with the Miccosukee and Seminole groups is ongoing, and reasonable regulations for protecting their rights and preserve resource values, as called for in the authorizing legislation, will be developed separately from this general management plan.

Relationship of the Plan to State Programs

Florida Area of Critical Concern. The Florida Environmental Land and Water Management Act of 1972 established procedures for designating areas with environmental or natural resources of regional or statewide importance as areas of critical concern. The Big Cypress area (see South Florida Region map) was designated as such an area by the Florida Legislature with the passage of the Big Cypress Conservation Act of 1973. That act set the boundaries of the critical area and established a process for developing land regulations, controls, and stipulations to govern the area. The boundaries include the national preserve, contiguous land and water areas that are ecologically linked with Everglades National Park, estuarine fisheries of south Florida, and the freshwater aquifer of south Florida. The area of critical concern was expanded in 1987 to include the lands added to the preserve in 1988. Under this law the state must approve the comprehensive plan and land development regulations for any local government within an area of critical state concern. In addition, any such local government must bring its comprehensive plan and land development regulations into conformance with the objectives, principles, and intent of the state laws.

"Save Our Everglades" Program. In 1983 Florida instituted the "Save Our Everglades" program. The objective of the program is by the year 2000 to make the south Florida Everglades, including Big Cypress, more like it was in 1900 than it is today. The program provided much of the impetus behind the 1988 federal legislation expanding the boundaries of Big Cypress National Preserve. "Save Our Everglades" continues to be a focus for hydrological and other environmental initiatives in south Florida.

Outstanding Florida Waters. The waters within Big Cypress have been designated by the state as "special waters" because of their exceptional recreational and ecological significance (Florida Administrative Code, chapter 17-3.041). The waters are to be preserved in a nondegraded state and protected in perpetuity for the benefit of the public. Industrial, commercial, and residential wastewater discharge (treated or untreated) and dredge and fill operations are prohibited except where clearly in the public interest. Storm water discharge is permitted only if it has been treated according to strict state standards.

Coastal Zone Management Program. The Florida coastal zone management program was adopted through the Florida Coastal Management Act of 1978. The program gives the state oversight responsibilities in controlling dredge and fill operations, pollution abatement, and other environmental concerns. As required by the federal Coastal Zone Management Act of 1972, the National Park Service will review the final general management plan for Big Cypress National Preserve to determine if it is consistent with the state program. The Park Service informally consulted with the Florida Department of Environmental Regulation before developing alternatives.

State Comprehensive Outdoor Recreation Plan. The Florida Department of Natural Resources prepared a state comprehensive outdoor recreation plan in 1981 to guide the development of recreational opportunities. The plan is revised biennially, and the 1985 revision listed projected 1990 recreational needs. Table 1 shows the needs for region IX, which includes Collier County and most of Big Cypress.

Table 1: 1990 Recreation Needs for Region IX

Recreational Activity	Statewide Ranking (1-92)
Saltwater beach activities	1
Bicycle riding	9
Saltwater fishing	16
Hiking	17
Nature study	29
RV/trailer camping	42
Freshwater fishing (non-boat)	53
Freshwater beach activities	58
Horseback riding	71
Visiting archeological/historic sites	91

Source: Florida Department of Natural Resources 1985.

There are no resources for saltwater or freshwater beach activities in the preserve. Although horseback riding is not a traditional activity in the preserve, some areas could accommodate this activity during dry periods. The other activities, however, can easily be accommodated in the preserve and were considered during the planning effort.

Issues beyond the Scope of the General Management Plan

Several issues, including some that were raised during planning meetings, have either been addressed as separate issues or were determined to be beyond the scope of the general management plan. These are discussed below:

Boundary expansion – As discussed in the previous section, the management of lands newly authorized for addition to Big Cypress under PL 100-301 will be addressed in an addendum to the final general management plan.

Status of trespass properties – PL 93-440 listed specific criteria for exempting certain properties from federal acquisition (sec. 3; see appendix A). The criteria for acquisition have been challenged in federal court and have been upheld as appropriate. Consequently, the general management plan will not address this issue.

Grazing – Currently there are six leases for grazing on 32,000 acres in the preserve. The leases date from October 11, 1974, or before, and they can only be renewed during the lifetime of the permittee or spouse; they are not transferable. The leases are gradually being phased out as existing lessees end operations, and it is probable that most grazing leases will be ended during the life of the general management plan. Therefore, grazing is not discussed as an issue in this document.

Construction of I-75 through Big Cypress – The conversion of Florida 84 to I-75 (construction of two additional lanes) was anticipated in PL 93-440 (sec. 4(b); see appendix A). The National Park Service has consulted with the Florida Department of Transportation and the Federal Highway Administration in the road design and has reviewed environmental documentation for the project. The Park Service is working with other agencies involved in the project to ensure that road construction will mitigate existing problems associated with Florida 84, including interruption of surface flows and wildlife movements. The only issue addressed in the general management plan is providing recreational access off I-75, within the original preserve.

Other management issues – Many specific management issues and alternatives that were raised during public involvement meetings were considered to be too detailed for inclusion in the general management plan or were inappropriate given the legislative mandates for the preserve. Suggestions ranged from changing the legislated wilderness boundaries in Everglades National Park to specifying methods, seasons, or bag limits for various small game. Many suggestions have been passed on to field managers for their consideration, but they have not been considered as major issues in this plan (see "Consultation and Coordination" for a discussion of these topics).

THE PROPOSED ACTION AND ALTERNATIVES

PLANNING PERSPECTIVE

The development of the proposed action and the alternatives was guided by the identification of important resource areas, the development of a management zoning scheme based on those resources and on the NPS *Management Policies* (NPS 1989a), the establishment of planning units, and the development of planning objectives. Each of these was a discrete step in the planning process, and the results are described briefly in this section to provide a context for readers to understand the proposed action and alternatives. The interrelationships between these steps is shown graphically in the Land Use Planning Process figure.

IMPORTANT RESOURCE AREAS

Before any alternatives were developed, important resource areas were identified, analyzed, and mapped. The criteria for determining such areas included the following:

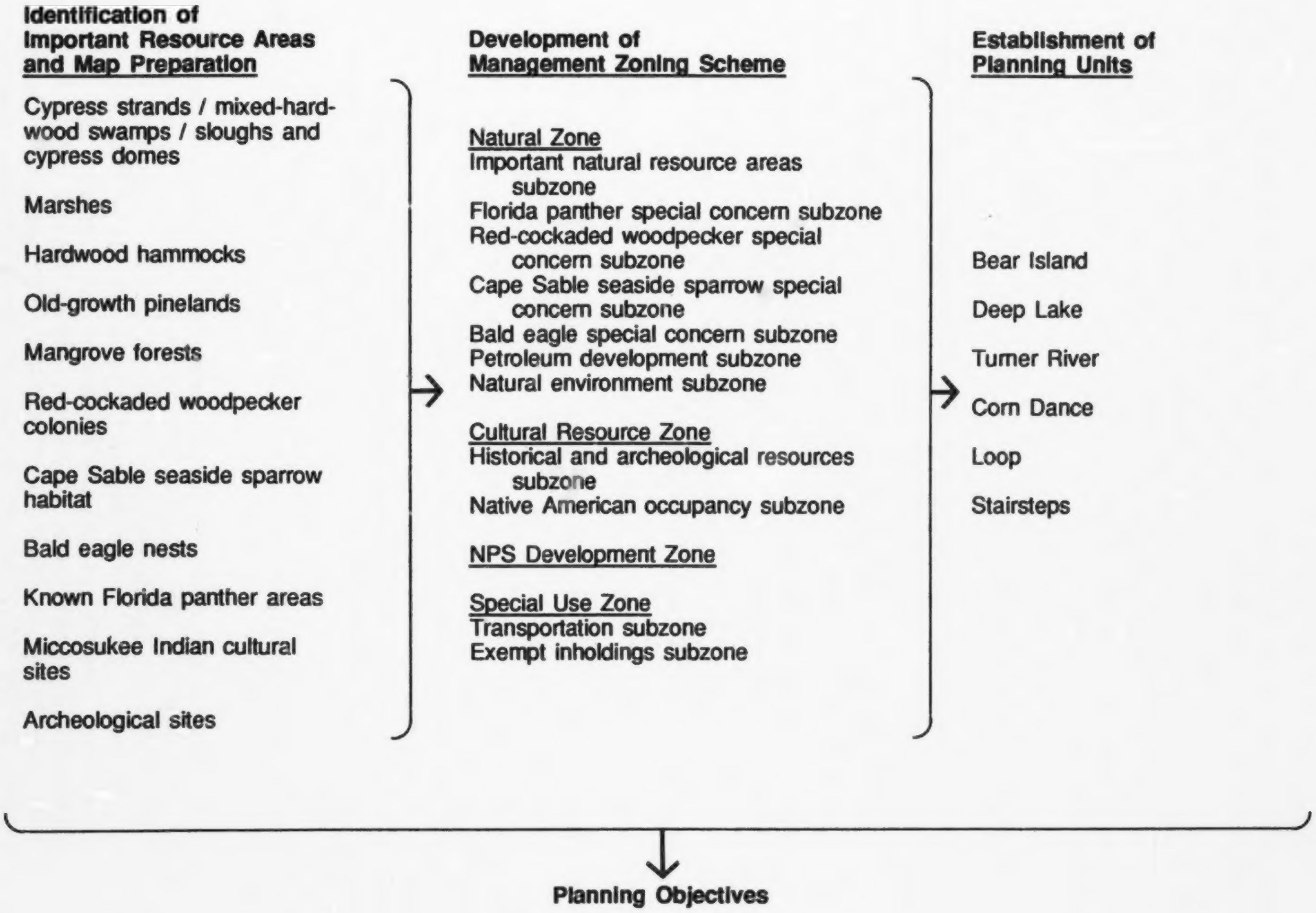
> superior examples of the natural, scenic, hydrologic, floral, faunal, and recreational values for which the preserve was established
>
> areas essential for maintaining water flow and quality to protect the ecological integrity of the preserve and Everglades National Park
>
> habitat necessary for the continued survival of federally recognized threatened or endangered species of plants and wildlife
>
> native American cultural sites, or important historic or archeological resources

Once these criteria were determined, information on the resources from NPS research, other federal and state agencies, and scientific literature was assembled and mapped. As part of this effort a detailed vegetation map was prepared by using infrared aerial photographs taken by the U.S. Geological Survey in 1984. Vegetation types that were identified as important resource values were plotted on a series of overlays, as were the remaining important resource areas. The identification of resource areas set many of the parameters for developing the alternatives. The designation of an important resource area does not automatically exclude use. Appropriate types and levels of use are recommended under various alternatives where compatible with the resource values and management objectives.

The important resources are described below. These descriptions may be modified as a result of new information or conditions.

> ***Cypress strands / mixed-hardwood swamps / sloughs and cypress domes*** – Strands, swamps, and sloughs are the major corridors of water flow in Big Cypress and are equally important to the Everglades ecosystem. Any interruption of this flow could have widespread adverse effects in both Big Cypress and Everglades. Strands, swamps, and sloughs also contain numerous rare and protected plants; species of concern include epiphytes, certain ferns, and rare trees (see "Affected Environment" section). This resource type also includes cypress domes, which provide pockets of permanent water and wildlife habitat similar to cypress strands.

LAND USE PLANNING PROCESS



Identification of Important Resource Areas and Map Preparation

Cypress strands / mixed-hardwood swamps / sloughs and cypress domes

Marshes

Hardwood hammocks

Old-growth pinelands

Mangrove forests

Red-cockaded woodpecker colonies

Cape Sable seaside sparrow habitat

Bald eagle nests

Known Florida panther areas

Miccosukee Indian cultural sites

Archeological sites

→

Development of Management Zoning Scheme

Natural Zone
Important natural resource areas subzone
Florida panther special concern subzone
Red-cockaded woodpecker special concern subzone
Cape Sable seaside sparrow special concern subzone
Bald eagle special concern subzone
Petroleum development subzone
Natural environment subzone

Cultural Resource Zone
Historical and archeological resources subzone
Native American occupancy subzone

NPS Development Zone

Special Use Zone
Transportation subzone
Exempt inholdings subzone

→

Establishment of Planning Units

Bear Island

Deep Lake

Turner River

Corn Dance

Loop

Stairsteps

↓

Planning Objectives

MAPS

TRANSPOSED TO

END OF VOLUME

Marshes – Marshes also have long hydroperiods, and any major alteration of water flow through this community could adversely affect both Big Cypress and Everglades. Marshes provide essential habitat for wading birds, including feeding habitat for the endangered wood stork, and the endangered Cape Sable seaside sparrow.

Hardwood hammocks – Hammocks are small tree-islands scattered throughout the preserve. Unlike other vegetation types in Big Cypress, hammocks are rarely flooded and tend to resist burning. They contain the majority of archeological sites known in the preserve. Many plant species in hammocks are rare, threatened, or endangered, ranging from small epiphytes to large trees. Wildlife species using hammocks include the state-protected *Liguus* tree snails and the federally listed endangered Florida panther.

Old-growth pinelands – Old-growth pinelands have never been logged. This forest type was once predominant throughout the southern coastal plain, but old-growth stands have been severely reduced by logging, development, and other land uses. In Big Cypress the old-growth pinelands are collectively among the largest such vegetative associations remaining in south Florida. Old-growth stands are essential habitat for the endangered red-cockaded woodpecker.

Mangrove forests – Mangrove forests help mitigate the destructive power of storm waves and contribute to estuarine food chains. They are also important nurseries and spawning grounds for numerous estuarine and marine species. In addition mangroves provide essential habitat for the manatee, American crocodile, and other protected species.

Red-cockaded woodpecker colonies – The red-cockaded woodpecker is a federal endangered species. There are an estimated 40 colonies in the preserve, the largest concentration known south of Lake Okeechobee.

Cape Sable seaside sparrow habitat – Big Cypress is one of three remaining population centers for the Cape Sable seaside sparrow, a federally endangered species. The Cape Sable sparrow only occupies seasonally flooded, freshwater marshes. The estimated 3,000 birds in Big Cypress represent about half of the known population.

Bald eagle nests – Three active bald eagle nesting sites are within the preserve. The bald eagle is an endangered species.

Known Florida panther areas – The Florida panther is under extreme risk of extinction and is federally protected as an endangered species. Survey work within the last five years has documented that panthers use virtually the entire preserve. Portions of the preserve where panther sign or radio-tracked panthers have been consistently found have been identified and mapped.

Miccosukee Indian cultural sites – Eleven Indian villages are located along US 41 and the Loop Road. Most of the 150 individuals who live in Big Cypress are independent Miccosukee Indians who do not belong to the federally recognized tribe and who do not choose to live on reservation land. As provided in the establishing legislation, Miccosukees and Seminoles may collect traditional subsistence materials and continue their religious practices in the preserve, subject to reasonable regulations. Ceremonial sites are regarded as important resource areas, but they are not shown on the map to ensure privacy and prevent vandalism.

Archeological sites – A total of 395 sites have been found within the preserve. These sites may contain valuable information on past occupations of the area by prehistoric people. Sites are protected under the National Historic Preservation Act of 1966, as amended, and the Archeological Resource Protection Act of 1979. The sites are not shown on the Important Resource Areas map to prevent vandalism.

MANAGEMENT ZONING

A Management Zoning map has been developed to indicate the management emphasis for specific lands and waters within the preserve. The management zones take into account important resources, development, environmental constraints, legal mandates, and other factors. Most of the preserve will necessarily be managed as a natural zone to ensure the protection of the important resource areas, and relatively small areas will be zoned for cultural resource management, NPS development, and special uses. Management zones and subzones are described below and are based on the legislation that established the preserve, NPS policies, the nature of the resources, the desired visitor experience, and established uses.

Natural Zone

Lands and waters in the natural zone will be managed to conserve natural resources and processes while accommodating uses and experiences that do not adversely affect the area's ecological integrity. The natural zone is subdivided into the important natural resource areas subzone; special concern subzones for the Florida panther, red-cockaded woodpecker, Cape Sable seaside sparrow, and bald eagle; and the natural environment subzone. The petroleum development subzone is also included because areas occupied by oil and gas facilities would eventually be reclaimed and restored to a natural condition.

Important Natural Resource Areas Subzone. This subzone consists of the ecological communities identified as important resource areas; therefore, it will be managed to restore and perpetuate natural processes and to limit disruptive activities. Established dispersed uses such as hunting, fishing, ORV use, grazing, camping, and hiking will be permitted and controlled. Additional long-term intensive uses such as oil and gas activity will be strictly regulated, or the rights acquired if necessary. The approximate acreage is 260,000.

Florida Panther Special Concern Subzone. This subzone consists of areas where panther sign and radio-tracked panthers have been frequently and consistently found. Although evidence of panthers has been found in other parts of the preserve, this subzone encompasses the areas where there is documented panther activity. This subzone overlaps the important natural resource areas and other subzones in the Bear Island, Turner River, Deep Lake, and Corn Dance units. In this subzone special management actions will be taken to increase the panther prey-base and to reduce and control potential human disturbance to panthers. The approximate acreage is 145,000.

MAPS

TRANSPOSED TO

END OF VOLUME

Red-Cockaded Woodpecker Special Concern Subzone. This subzone includes all known red-cockaded woodpecker colonies in the preserve. Known colonies are in the Turner River, Corn Dance, and Stairsteps units. The subzone is defined by nesting trees and a 1,600-foot buffer area. Special management actions will be taken to prevent disturbance to nesting birds, and habitat will be maintained principally by prescribed burning. This subzone overlaps with other subzones in the natural zone and includes 26 sites totaling 4,800 acres. Additional acreage may be added if new colonies are located.

Cape Sable Seaside Sparrow Special Concern Subzone. This subzone contains Cape Sable seaside sparrow habitat in marsh and wet prairie in the Stairsteps unit. Like the subzone for the red-cockaded woodpecker, this subzone will be managed to prevent disturbance to nesting birds, and habitat will be maintained by prescribed burning. This subzone overlays with other subzones of the natural zone and includes roughly 6,400 acres.

Bald Eagle Special Concern Subzone. All known bald eagle nesting trees and a 1,500-foot buffer area around each tree (USFWS, Murphy et al. 1984) are included in this subzone. The three nesting trees that are known to be actively used are all in the Stairsteps unit. This subzone will be managed to prevent disturbance to nesting eagles. The subzone overlaps with other subzones in the natural zone and includes about 500 acres.

Petroleum Development Subzone. Preserve lands currently used for oil and gas operations (including oil pads, pipelines, and roads maintained by petroleum companies) are classified as part of the petroleum development subzone. As oil and gas activities continue in the preserve, additional areas will be added to this subzone. Although most of the lands in this subzone will have long-term occupancy (40 to 80 years), all will eventually be reclaimed and returned to natural conditions. Special precautions would be taken during reclamation to avoid disturbance to significant archeological resources. Total acreage now in the petroleum development subzone is 259 acres.

Natural Environment Subzone. The natural environment subzone contains natural resources that are somewhat less significant than the other subzones in the natural zone. The natural environment subzone will remain largely undeveloped and will be managed to conserve natural resources. Those uses cited in the enabling legislation (see "Purpose of and Need for Action") will be permitted, subject to reasonable regulations. Approximately 290,000 acres are included in this zone.

Cultural Resource Zone

The cultural resource zone will be managed to preserve, protect, and interpret cultural resources and their settings. To avoid encouraging vandalism and to protect the privacy of native residents of the preserve, the cultural resource zone is not shown on the Management Zoning map.

Historical and Archeological Resources Subzone. This subzone will be managed to protect historical and archeological resources in place. Only 23 of the preserve's 395 known archeological sites are included in this zone. These 23 sites have been identified by the NPS Southeast Archeological Center as in special need of protection. Even though the historical and archeological subzone includes only 23 archeological sites thought to be in special need of protection, the National Park Service recognizes its obligation to protect all archeological sites within the preserve. The Park Service further recognizes its obligation to work with the Florida state historic preservation officer to nominate those archeological sites that appear to be eligible for inclusion on the National Register of Historic Places.

Native American Occupancy Subzone. This subzone consists of Miccosukee villages, agricultural plots, and currently used ceremonial sites. This subzone is subject to redefinition upon consultation with native American groups and promulgation of reasonable regulations by the secretary of the interior.

NPS Development Zone

This zone contains major NPS facilities used to manage the preserve and to meet visitor needs. Included are areas where park development or intensive use substantially alter the natural environment. The Ochopee administrative and residential area, the Oasis operational center, the Loop Road interpretive center, the Trail Center residential area, six designated frontcountry campgrounds, and NPS-maintained roads are included in this zone. The total area is approximately 300 acres.

Special Use Zone

The special use zone applies to areas within the preserve where NPS administrative control over lands and waters either is lacking or is secondary to that of another government agency, organization, or private party. State-owned school lands, however, are classified as part of the natural zone because of an agreement between the National Park Service and the state of Florida to manage these inholdings consistent with the surrounding preserve lands. There are two subzones – transportation and exempt inholdings.

Transportation Subzone. This subzone includes most of the major roads within the preserve, which are maintained by the state of Florida and the local counties. Also included is the Jetport (Dade-Collier Training Airport), the largest inholding in the preserve. This subzone includes approximately 25,400 acres.

Exempt Inholdings Subzone. This subzone is made up of 200 frontcountry residences, commercial establishments, and backcountry properties meeting the criteria for exempt inholdings, defined as improved properties by PL 93-440. To meet the criteria for "improved" status, a structure must have been built before November 23, 1971, the structure and land must be under the same ownership, and the use of the structure and the land must not constitute a threat to the preserve's resources. Total acreage in this subzone is approximately 100 acres.

Trespass properties, approximately 200 residences and backcountry camps not meeting the legislation's improved property criteria, are being removed from federal lands, and the sites will be reclaimed. These sites are classified as part of the natural zone, rather than the special use zone.

PLANNING UNITS

To facilitate planning and to ensure that all planning issues and concerns are systematically addressed, the preserve was subdivided into six units. The existing management units were reviewed, and new planning units were established based on the important resource areas and established use patterns. Roads and trails were selected as the boundaries so that the units would be clearly discernible in the field. Under the proposed action, as well as alternatives A and B, these planning units would be adopted as the preserve's new management units. The six planning units are Bear Island, Deep Lake, Turner River, Corn Dance, Loop, and Stairsteps. Each unit is described briefly below; all the units are shown on the Planning / Management Units map.

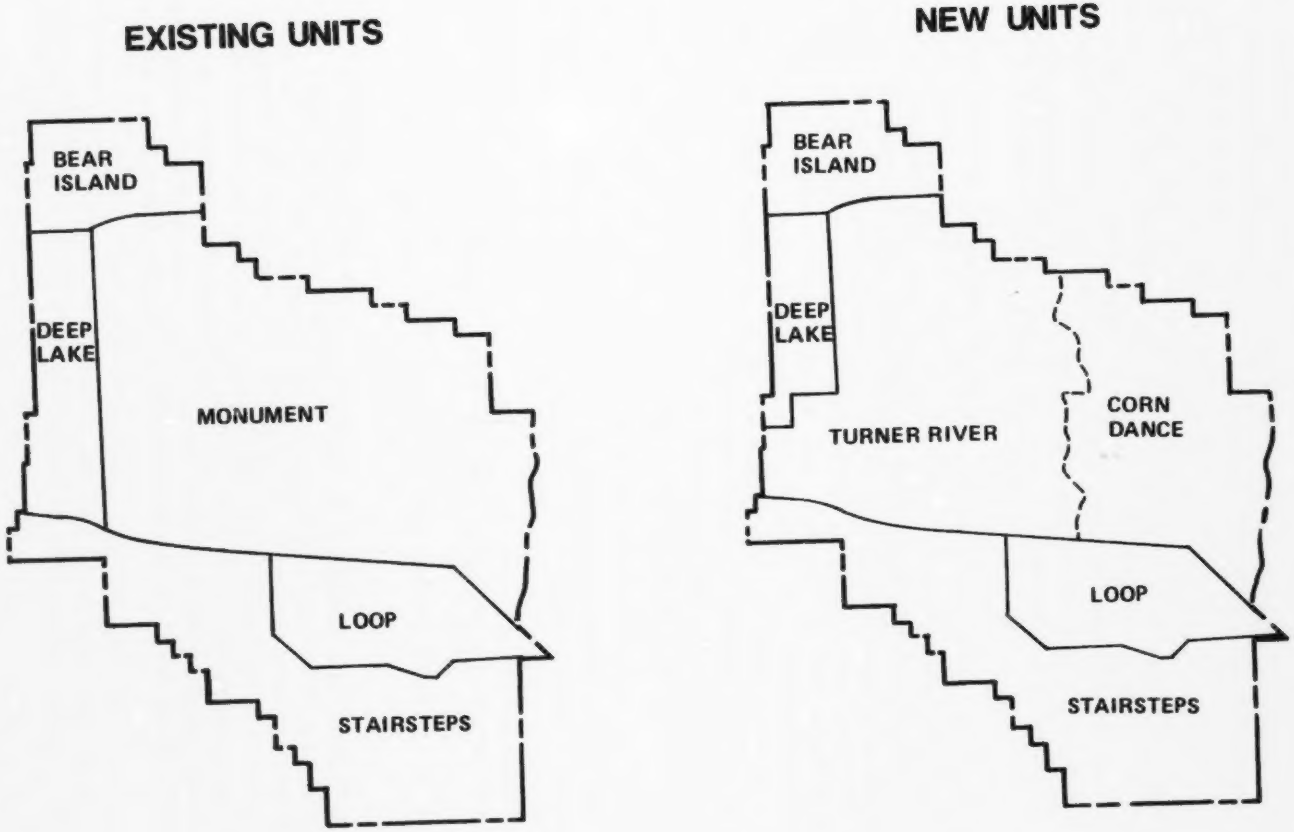
Bear Island Unit

The Bear Island unit (the same as the existing management unit) includes all preserve lands north of Florida 84. This unit has one of the highest concentrations of important resource areas in the preserve (see Important Resource Areas map). It also has a relatively healthy panther population and is the only unit where panther activity is apparently increasing. It has been identified by the governor's Technical Advisory Committee on the Florida Panther as requiring special management. A variety of vegetation types characterize the unit, including extensive marshes, hardwood hammocks, and strands/swamps. Because of the mix of marshes and upland sites, the unit is rich in cultural resources. Much of the unit is leased for cattle grazing, and prescribed burns are conducted to improve grazing conditions.

Oil production in this unit has been active for many years, and an extensive network of roads provides access to existing pads. Other development includes several frontcountry exempt inholdings along the northern extension of Turner River Road and two backcountry exempt inholdings. The Bear Island campground is approximately 2 miles east of Turner River Road and is the largest designated campground in the preserve.

Deep Lake Unit

The Deep Lake unit is bordered by Florida 84 on the north, Turner River Road on the east, the preserve boundary on the west, and Wagonwheel Road on the south (the present Deep Lake management unit extends farther south to US 41). The unit is apparently used by the Florida panther for moving between the Bear Island area and Fakahatchee Strand. Prairies, cypress strands, and mixed hardwood swamps dominate the unit. An abandoned oil road and two pads are present, but there is no current oil or gas activity. Two backcountry exempt inholdings are in the southern portion of the unit; there is one trespass property.


EXISTING UNITS

NEW UNITS

BEAR ISLAND
DEEP LAKE
MONUMENT
LOOP
STAIRSTEPS
BEAR ISLAND
DEEP LAKE
TURNER RIVER
CORN DANCE
LOOP
STAIRSTEPS

PLANNING \ MANAGEMENT UNITS

Turner River Unit

The new Turner River unit is the largest of the planning units and lies in the central portion of the area between Florida 84 and US 41. (It consists of the western half of the present Monument management unit.) The eastern boundary is the western leg of the Florida National Scenic Trail, and the western boundary is the Deep Lake unit. The southwest corner of the unit includes the area between Wagonwheel Road and US 41, extending to the western boundary.

There is evidence of panther activity in the northwestern corner of this unit, and the northeastern portion is dominated by old-growth pinelands, which support scattered red-cockaded woodpecker colonies. The rest of the unit is characterized by cypress strands and mixed-hardwood swamps, second-growth pinelands, and prairies. Archeological sites are widely scattered throughout the unit.

There is no current oil activity, although three short spur roads lead to abandoned pads. The Sunniland trend crosses the unit in the north, so future oil exploration and production is highly probable. This unit has the most backcountry camps of any unit; about 55 are exempt inholdings and 80 are trespass properties. Frontcountry exempt inholdings are located along Turner River Road, Birdon Road, and Wagonwheel Road.

ORV and hunting uses are high. ORV trails crisscross the unit; several follow old tram roads dating from early logging operations. This unit has the highest incidence of arson fires in the preserve. Most are started from US 41, Turner River Road, or Birdon Road.

Corn Dance Unit

The Corn Dance unit is also a proposed new management unit. It is bounded on the west by the Florida National Scenic Trail, on the south by US 41, and on the east and north by the preserve boundary. (This area is the eastern half of the present Monument management unit.)

The unit has a documented resident panther population. Old-growth pinelands in the northern half of the unit provide red-cockaded woodpecker habitat, and many hardwood hammocks have indigenous tree snail populations. Cypress strands, prairies, and dwarf-cypress prairies dominate the southern portion of the unit. Archeological sites are scattered throughout the unit, and the Corn Dance ceremonial grounds were formerly used by the Miccosukee Indians.

Development includes the Jetport, 30 backcountry exempt inholdings, and 40 trespass properties. The second largest oil field in the preserve is at Raccoon Point in the central part of the unit. Like the Turner River unit, the presence of the Sunniland trend indicates a high probability of future oil activity. The Corn Dance unit has the least concentration of ORV trails of all the units open to ORV use.

Loop Unit

The Loop unit (the same as the existing management unit) is bounded on the north and east by US 41 and on the south and west by Loop Road.

Vegetation includes cypress strands, mixed-hardwood swamps, large hardwood hammocks (known for their indigenous tree snails), prairie, and dwarf-cypress prairie. This unit has been closed to ORVs and hunting dogs since 1977 in order to provide a primitive area for recreation (including hunting) and a control area for determining the effects of ORV and hunting dog use.

Several exempt inholdings are along Loop Road, and there are at least seven backcountry trespass properties. A few short spur roads lead to abandoned oil pads; there is no current oil activity, and development potential appears to be low.

Stairsteps Unit

The Stairsteps unit (the same as the existing management unit) consists of the portion of the preserve between Everglades National Park and US 41 and Loop Road.

This unit is the wettest area of the preserve, and it has a direct hydrological link to the Everglades. Marshes cover nearly half the unit, and there are more than a dozen strands and sloughs. The only mangrove area in the preserve is in this unit. The marshland supports the endangered Cape Sable seaside sparrow, and adjacent forested areas are used by bald eagles for nesting. Upland areas include numerous small tropical hardwood hammocks (with indigenous tree snails) and old-growth pinelands (with several red-cockaded woodpecker colonies) in the Lostmans Pines area.

Airboats are the primary means of transportation in the marshlands, and this unit is often referred to as airboat country. Hunting with airboats is a popular activity, particularly frogging. Frogs are hunted at night with a spotlight and gigging equipment.

There are at least 13 backcountry exempt inholdings and over 60 trespass properties. Almost all camps are on hardwood hammocks or pine islands in the marshlands or wet prairies.

No mineral activity occurs in the unit, and mineral potential appears to be low.

PLANNING OBJECTIVES

The following objectives are based on the intent of the establishing legislation and were established to guide the development of the proposed plan and alternatives. These objectives can be achieved in different ways, as specified in the alternatives.

Visitor Use

Visitor Services	Orient visitors to Big Cypress and foster an understanding of the natural and cultural history of the Big Cypress swamp.
	Provide appropriate, resource-related recreational opportunities for various publics.
	Provide for public safety.
Hunting Management	Maintain an ecological balance and natural abundance of wildlife populations.
	Provide for diverse hunting opportunities at levels compatible with the purposes of the preserve.
ORV Management	Reduce adverse impacts to vegetation and soils.
	Provide for diverse visitor experiences at levels compatible with the purposes of the preserve.

Natural Resource Management

Hydrological Management	Restore natural water flows in Big Cypress National Preserve and to Everglades National Park.
	Avoid further hydrological disturbance to the Big Cypress watershed.
	Maintain water quality.
Minerals Management	Permit access for geophysical exploration, exploratory drilling, and production of private oil and gas resources, while at the same time ensuring the following: the protection of important resource areas the protection of air and water quality in Big Cypress National Preserve and Everglades National Park the mitigation of surface disturbance the restoration of abandoned sites

	Avoid conflicts with visitor use and enjoyment, and provide for visitor safety.
Vegetation Management	Maintain habitat for rare and legislatively protected species.
	Control and reduce the spread of exotic plants within Big Cypress National Preserve.
	Protect Everglades National Park from the spread of exotic plants.
Fire Management	Protect public and private property, and provide for visitor safety.
	Protect important natural and cultural resources.
	Provide for fire-dependent ecological communities and wildlife populations, and restore the dynamic role of fire in Big Cypress.
Wildlife Management	Improve the health and recruitment of Florida panther populations and their prey, and maintain panther habitat.
	Maintain habitat for the Cape Sable seaside sparrow and red-cockaded woodpecker.
	Protect *Liguus* tree snails and maintain their habitat.
	Protect other endangered species.
	Eliminate or control feral hogs where they are not essential as panther prey; eliminate or control other exotic species in the preserve.
Cultural Resource Management	Protect all cultural resources on or eligible for the National Register of Historic Places; prior to evaluation, protect all known cultural resources.
	Cooperate with native Americans to continue their usual and customary use and occupancy of the preserve lands and resources subject to reasonable for resource protection.
	Protect native American ceremonial sites (including burial sites) from discovery, intrusion, and disturbance.

Provide for maximum native American participation in any newly authorized revenue-producing visitor services within the preserve.

General Development

Minimize impacts on floodplains and wetlands, rare and protected species, habitat diversity, and other natural resource values.

Provide for visitor services and operations with minimal development.

In establishing planning objectives, special consideration was given to the management of oil and gas operations, a prior existing right of mineral ownership that would continue to be allowed under regulated conditions as long as the primitive character of the preserve was not jeopardized. Under the proposed action and alternatives A and B, the National Park Service would ensure that at any one time at least 90 percent of Big Cypress National Preserve would continue to be dedicated to the "natural, scenic, hydrologic, floral and faunal, and recreational values" for which it was established and to be free of the adverse influences of industrial development such as oil and gas operations. Considering these management objectives, a loss of more than 10 percent of the preserve to oil and gas activity, including adjacent lands indirectly affected by such activity, would be considered a detriment to the ecological and aesthetic integrity of Big Cypress. In that event the National Park Service would notify and petition Congress for the funds to acquire the mineral estate.

PROPOSED ACTION / DRAFT GENERAL MANAGEMENT PLAN

The proposed action constitutes the National Park Service's draft general management plan for Big Cypress National Preserve.

VISITOR USE

Visitor use at Big Cypress National Preserve would focus on interpretation and recreational activities. Interpretation would consist of information and orientation programs for visitors before they arrived at the preserve, trip planning assistance inside the preserve, and on-site interpretive exhibits and trails. Present recreational activities would continue to be available, subject to appropriate restrictions to ensure the protection of fragile resources. These activities include hunting, ORV use, camping, canoeing, hiking, and picnicking. Concessioners could provide additional services, such as hunting guides and tours. Facilities that would be provided or upgraded to support these activities are described in the "General Development" section, and activities and programs are described below.

Interpretation

An interpretive program would be developed for Big Cypress National Preserve. Details of media and programming would be determined in a new interpretive prospectus. It would explain the fragile dynamics of the wetland ecosystem and man's relationship to it, strengthen the preserve's identity, foster an understanding of why this area is part of the national park system, and encourage visitors to get out of their cars and see representative portions of the preserve firsthand. Interpretive programs would explain the distinction between a national park and a national preserve in order to clarify why activities such as ORV use, oil and gas exploration and development, and hunting are allowed here but not in Everglades National Park. Programs would also explain how such activities are managed in the preserve to protect natural and cultural resources.

Visitors and recreationists would be encouraged to use this area in a way that ensured protection of the preserve's many resources. Programs and activities would be tailored to both tourists and recreationists. Visitors would be provided with a range of options for discovering the preserve, and they would receive help in planning their stays based on their interest and available time.

The range of interpretive themes for visitor programs would include the following:

> ecosystem dynamics and the interrelationships between Big Cypress, the Everglades, and the entire south Florida ecosystem
>
> the presence of man within this natural wetland system, from ancient Indian inhabitants to early settlement (including road building, logging, and land development) to current uses of the preserve
>
> the continuing challenge to achieve and maintain a balance between preservation and use
>
> the significance and status of the Florida panther and its habitat needs

The Big Cypress interpretive program would emphasize man's continuing interaction with south Florida ecosystems and would avoid duplicating programs presented at Everglades National Park. The interpretive program as outlined below would use existing structures and facilities where possible to reduce costs.

Information and Orientation. Information and orientation programs would be developed to reach people before they came to the preserve. Publications would be prepared to inform potential visitors about what to expect, including limitations of the swamp experience and how to properly prepare for it. Regional travel guides, road maps, newspapers, and magazines would also be used to get information to people. The preserve's folder and other previsit information would be made available to nearby state and federal park and recreation areas, government offices, information centers, and commercial establishments in the region.

To reach the large number of potential visitors in urban areas on both Florida coasts, a short videotape program would be developed. This program could include information about Big Cypress, as well as Biscayne and Everglades national parks. To stimulate an interest in these areas, the resources would be described and people would be told how to get there and what opportunities are available. The tapes could be made available to hotels and motels to reach out-of-state tourists, and they could also be shown on local television for Florida residents.

A wayside exhibit orientation/information system would be provided at three locations – at the east and west entrances on US 41 (just inside the preserve boundary) and at the rest stop at mile-marker 38 on Florida 84, which is outside the preserve. A map at each wayside would show visitors where they are with respect to the preserve and nearby opportunities. Text would briefly explain the purpose of the preserve and its major resource components.

Both the Oasis visitor center/ranger station and the Ochopee headquarters would continue to provide information and orientation for visitors, plus trip-planning assistance for visitors.

Oasis Visitor Center. The Oasis visitor center/ranger station, in the middle of the preserve on US 41, would serve as the primary interpretive stop for visitors. Interpretive programs would focus on the film *Living Waters of Big Cypress*, special interest videotapes, and exhibits. (The film has already been produced, and equipment has been acquired so the film can be shown to visitors at scheduled times in the recently remodeled audiovisual room.)

A library of videotapes dealing with special topics of interest to groups or individuals (including repeat visitors) would be developed for nonpeak periods when the audiovisual room is not heavily used. High-priority theme topics for this specialized video library include the following:

> *Prehistorical and historical themes* – prehistoric habitation sites and travel routes, local folklore and place names, timber industry and tram roads, alligator hunting and frogging, plume industry, Indian wars, old town sites, rum running, airboats and buggies, oil/gas activity and rock mining, land development (including canal and road construction), Jetport construction, preserve establishment, and native American life in the preserve today.

Natural resource themes – geology, hydrology/climate, the Florida panther and other endangered species, exotic plants, common plants and animals

Recreation themes – Florida National Scenic Trail, hunting, ORV use, and others

Preserve management themes – rules and regulations, rationale for NPS management actions

The specialized videotapes would offer more in-depth information than could be conveyed through exhibits or the film. The videotapes would also be used as part of an outreach program for school groups, senior citizens, and other special interests.

Videotapes for this library could be solicited from schools and universities in the region, special interest groups or clubs, and individuals. Because of recent technological advances in video electronics, the Park Service might be able to encourage these sources to make tapes that would relate to specific themes and to donate them to the preserve's video library.

The recently remodeled exhibit area in the visitor center would be used for new exhibits. The exhibits would focus on the general interpretive themes and reinforce the message of the film *Living Waters of Big Cypress*. For example, exhibits might concentrate on endangered species, the importance of the Big Cypress/Everglades hydrological relationship, and man's use of the preserve (using historical and contemporary photographs). Commonly asked questions about the preserve would also be answered (for example, why is a national preserve different from a national park?).

Publication sales would be provided at the information desk, which has been recently remodeled. The desk would be staffed on a full-time basis. A new orientation graphic or map of the preserve would help visitors plan their stays. Signs would be posted in the parking area to direct visitors just wanting ORV permits to the west side entrance, while all other visitors would be directed to the main entrance on the south side.

The borrow canal directly in front of the visitor center entrance would be relandscaped so that visitors could view aquatic plants and wildlife. A short elevated boardwalk would lead from the proposed Oasis picnic area along a portion of the canal adjacent to US 41 (see Proposed Oasis Development Concept Plan map). A brochure or some other appropriate form of interpretive media would be provided to give visitors a brief historical overview of canal construction within the preserve. It would include a checklist and description of wildlife most likely to be seen along borrow canals within the preserve, and it would identify and describe the most common plants and trees associated with these man-made aquatic environments.

Interpretive Trails. Short interpretive loop trails would be developed at the Oasis picnic area, on the Loop Road, and at Bear Island. The interpretive boardwalk at Kirby Storter Roadside Park would be extended. Interpretive media would be provided for each of these trails.

The interpretive loop trail at the Oasis picnic area would be developed on the east side of the visitor center as part of the Florida National Scenic Trail. It would provide an opportunity for picnickers to explore a dwarf-cypress prairie on foot.

On the west end of the Loop Road four interpretive pulloffs with trailheads would be developed. Each stop would give visitors an opportunity to take a short, self-guided interpretive walk on a trail or boardwalk (or a combination of the two) through one of the vegetation types associated with Big Cypress. The intent would be to give visitors a firsthand impression of a cypress prairie, a cypress strand, a pineland, and a hardwood hammock.

The Loop Road would be upgraded to allow visitors a chance to drive more slowly (35 mph maximum) through the preserve and to stop anywhere along this 25-mile route to view wildlife or other points of interest. The present interpretive center on the Loop Road would continue to function as an environmental education camp for school groups in the south Florida area.

An interpretive loop trail in the Bear Island unit would be developed at the north end of Turner River Road. The trail would wind through cypress strands, mixed-hardwood swamps, and hardwood hammocks. A commanding view of East Hinson Marsh and associated waterfowl and wildlife habitat would be the final stop. This large, freshwater marsh would provide a dramatic contrast to those portions of the trail that pass through a mosaic of dense vegetation types.

The existing boardwalk at Kirby Storter would be extended so visitors could experience a more remote portion of the cypress strand and a fringe of the adjacent cypress prairie. The extended boardwalk would also allow visitors to escape some of the traffic noise on US 41.

Hunting

Overview. Diverse hunting opportunities would be provided at levels compatible with the purposes for which the preserve was established. The management goals for hunting would be to protect the important resources of Big Cypress and to improve the natural abundance and health of the white-tailed deer herd, as well as other native species. Management strategies would be flexible to respond to annual increases or decreases in game populations, as well as indirect changes in other wildlife populations. Strategies would be implemented through regulations developed in consultation with the state and subject to public involvement.

There are conflicting opinions about how best to manage the deer herd to ensure its health and natural abundance, so the proposed action is based on the best current information and professional judgments. All proposed actions would be interim measures pending the collection of more accurate data to develop long-term game management strategies and hunting regulations for the preserve. During this interim period a comprehensive ecological study would be conducted of deer, feral hogs, and panthers. The National Park Service would develop a research design for the comprehensive ecological study in cooperation with the Florida Game and Fresh Water Fish Commission and the U.S. Fish and Wildlife Service. At the completion of the proposed study, or at appropriate intervals where data supported obvious conclusions, the proposed action would be reevaluated and changed to reflect the study conclusions (see the "Natural Resource Management" section for a more detailed discussion of this study).

Until recently, hunting regulations for Big Cypress were among the most liberal of Florida's wildlife management areas in terms of numbers of allowed methods, season lengths, and use of dogs (FGFWFC 1985a). For instance, during the 1985-86 season hunting of some type was permissible in the preserve on 280 days per year. For the 1987-88 season that number was reduced to about 170 days, primarily by reducing the raccoon hunting season. Under the proposed action hunting of some type would be allowed on 140 days. The purpose of the limitation is to better protect wildlife resources by allowing more efficient use of available manpower to monitor hunting and enforce game laws.

Deer and Hog Hunting. White-tailed deer and feral hogs are harvested during the general gun, muzzle-loading gun, and bow hunting seasons. To improve the quantity and health of the deer herd and to reduce pressure on the panther's prey base, the total number of deer and hogs harvested annually by all methods would be reduced by 25 to 50 percent, based on the average annual number of deer and hogs harvested between 1980 and 1986.

Several interrelated actions would be taken. The general gun season would be reduced from the current 60 days to 40 days to allow for more effective game law enforcement by both the Park Service and the Florida Game and Fresh Water Fish Commission. The present nine-day hunter quota permit administered by the state would be extended to a full-season quota permit (40 days). Therefore, to hunt within the preserve during the general gun season, hunters would be required to have a Florida hunting license, a state wildlife management area stamp, and a full-season quota permit. The full-season quota permits would be nontransferable. The number of quota permits available to the public would be determined annually by the National Park Service and the Florida Game and Fresh Water Fish Commission. The annual quota would be based on biological information on game species from previous harvests and wildlife surveys. A group application system would be developed to continue the popular social characteristics related to hunting in the preserve (for example, up to eight people in a group could apply together for permits). The full-season permits would give managers a better tool to monitor the number of hunters using the preserve and the quantity of game harvested, and they would also allow more accurate data to be gathered for long-term game management recommendations and hunting regulations.

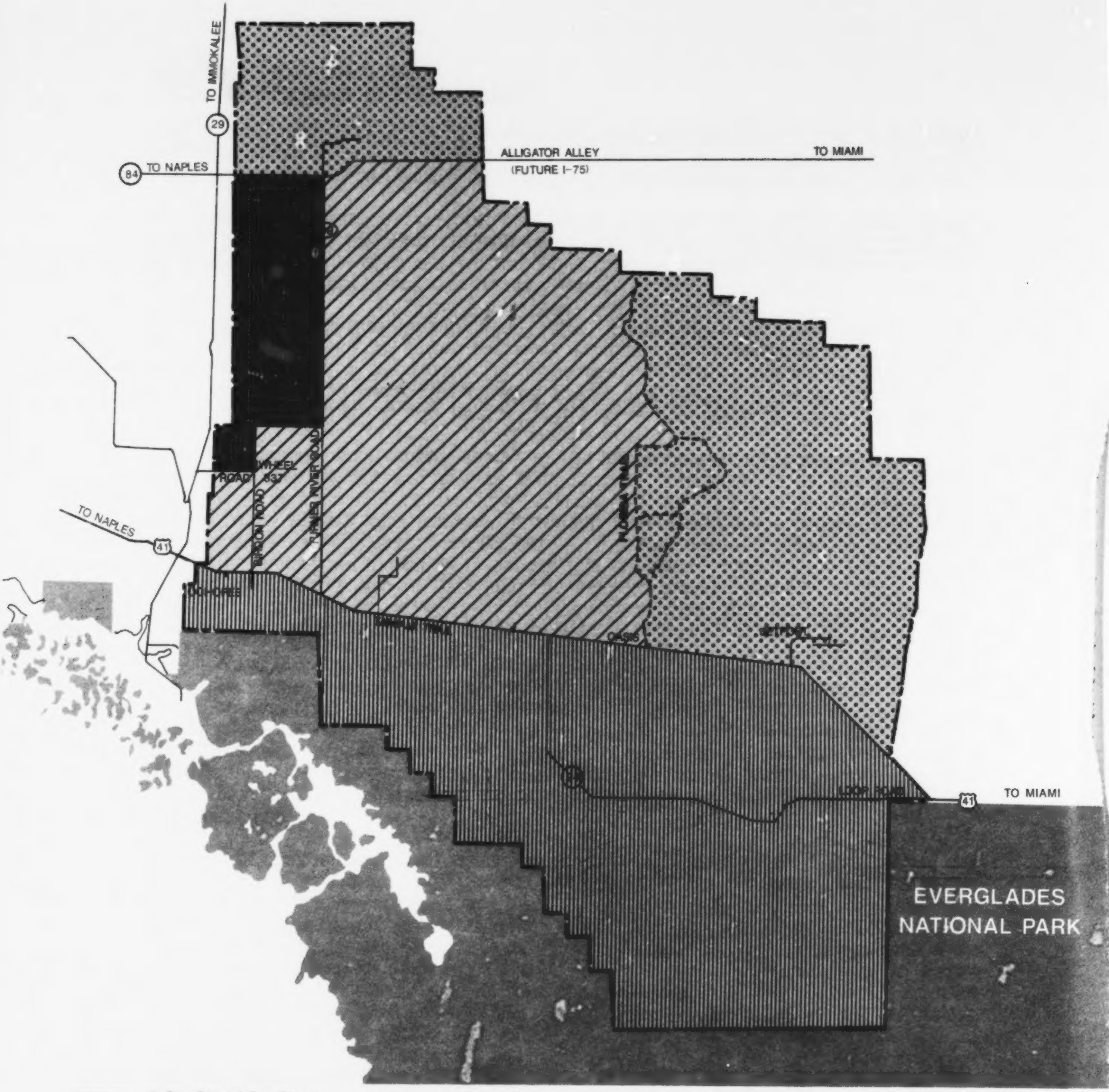
The use of dogs for deer and hog hunting would be allowed only in the Turner River unit during the first nine days of the general gun season. There is evidence that the use of dogs for deer hunting increases the number of animals taken and that there are fewer deer per acre in areas where dogs are used for hunting (FGFWFC 1982, 1985a). Therefore, to increase the natural abundance of deer, and to reduce potential disturbance to panthers, the use of dogs for deer and hog hunting would be prohibited in known panther areas (Bear Island, Deep Lake, and Corn Dance units). In addition dogs would be prohibited in the Stairsteps unit because scattered hammocks provide the only raised areas where deer can escape high water; consequently, deer are highly vulnerable to hunting with dogs. When dogs are used in this habitat, deer can be pushed into high water for illegal taking (killing swimming deer is illegal). Prohibiting dogs would reduce this illegal take of deer and help increase the deer population in an area adjacent to a known panther population in Everglades National Park.

Deer and hog hunting in the Loop unit would continue to be for walk-in hunters only, and in the Deep Lake unit for bow hunters only. No dogs would be allowed in either unit. The intent is to vary the hunting experience. Furthermore, the change would provide more control in the Deep Lake unit over illegal hunting and would allow the recovery of deer populations, which are depressed in this unit. Both units would be closed to ORV use.

Small Game, Turkey, and Migratory Game Bird Hunting. Regulations for these hunts would be similar to current requirements except that the proposed action would prohibit the use of dogs for small game or bird hunting in the Stairsteps and Deep Lake units, as well as in the Loop unit, which is currently closed to hunting dogs.

Night Raccoon Hunting. Night raccoon hunting, with hunters being able to use lights and dogs, would be permitted only in the Turner River unit. Restricting this activity in the other units would reduce the potential for deer poaching, which could in turn adversely affect the panther prey base. It could also reduce potential disruptions of panthers' nocturnal feeding habits.

Frogging. Currently, the noncommercial taking of frogs is legal under state law but is not consistent with NPS regulations. Frogging, like hunting and fishing, was a traditional recreational activity before the national preserve was established, and it may be consistent with the purposes of the preserve. Therefore, the National Park Service would propose regulations that allow the superintendent to issue permits for the noncommercial taking of frogs upon a written determination (1) that the taking would not be detrimental to other park wildlife or the reproductive potential of frogs, and (2) that it would not have an adverse effect on the ecosystem. The purpose of the permit would be to collect data and monitor harvest levels to determine if there would be any effects on wading birds and other forms of wildlife that depend on frogs.


TO IMMOKALEE
29
84
TO NAPLES
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
WHEEL
ROAD
837
BIRDON ROAD
TURNER RIVER ROAD
TO NAPLES
41
OCHOPEE
OASIS
LOOP ROAD
41
TO MIAMI
EVERGLADES
NATIONAL PARK

░ 40-Day General Gun Season; 140 Days Per Year Open to Hunting

▥ No Dogs

■ Bow Hunting Only

▨ Dogs Permitted for Deer and Hog Hunting during Part of the General Gun Season and for Bird and Raccoon Hunting

⁘ Bird Dogs Only

HUNTING MANAGEMENT
PROPOSED ACTION

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,020-A

0 3 6 9 MI.

NOTE: Numbers of Hunters for All Seasons Would Be Controlled by a Full-Season Quota System.

ORV Use

ORV use would continue to be recognized as a practical means of transportation and an appropriate recreational activity when regulated. As directed by PL 93-440 and Executive Orders 11644 ("Use of Off-Road Vehicles on the Public Lands") and 11989 ("Off-Road Vehicles on Public Lands"), ORV use would be regulated and controlled under a policy that preserve lands be closed to ORV use except for those areas or trails that are suitable and specifically designated as open to such use. Important resource areas would be protected, and excessive degradation of soils and vegetation would be prevented. Regulation and control of ORV use would be implemented through (1) a vehicle permit system, (2) general regulations governing the operation of vehicles, and (3) a system of designated access points, areas, or trails for each management unit with ORV use.

Vehicle Permit System. To enforce equipment and safety standards and to monitor ORV use, an annual NPS permit would continue to be required for all ORVs operating within the preserve. A fee has been established for the permit to offset administrative costs. To qualify for a permit, each vehicle must meet state and NPS equipment and safety standards (see 36 CFR 1.5 and 7.86). To ensure that ORV use did not exceed current levels, no more than 2,500 ORV permits would be issued. If requests for permits exceeded the quota, permits would be issued by random draw. Under such circumstances special landowner access permits would be issued to allow these individuals direct access to their inholdings by the shortest designated route. ORV use by landowners, other than for access to their inholdings, would be by random draw. Because it has been shown that tracked vehicles cause damage to soil, vegetation, and archeological sites (Duever et al. 1981; Duever et al. 1986a; Florida state historic preservation officer, personal communication 1988), tracked vehicles would be prohibited. The National Park Service would also terminate its use of such equipment within the preserve.

General ORV Regulations. Existing regulations (36 CFR 1.5 and 7.86) would continue to be enforced. Regulations at 36 CFR 7.86 would be modified to incorporate the changes contained in the approved general management plan. These regulations now prohibit the operation of ORVs in a manner that could adversely affect the preserve's resources. Damaging and irresponsible practices, such as "mudding," racing, and tug-of-war contests with ORVs, would continue to be prohibited. Cutting vegetation, ditching, filling, or other activities to build new trails or to improve existing trails would also continue to be prohibited. As provided by 36 CFR 7.86, the superintendent would have authority to close portions of the preserve to ORV use if the use represents a threat to resources. Executive Order 11989 requires immediate closure of areas or trails, or the discontinuation of certain vehicle types, whenever it is determined that ORV use "will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat or cultural or historic resources of particular areas or trails" of the preserve. The public would be notified before any area or trail was closed, or a vehicle type was discontinued, under such conditions.

The National Park Service would continue to support the Florida Game and Fresh Water Fish Commission's ban on the use of ATVs for hunting, fishing, and frogging. ORV use would continue to be prohibited on the Florida National Scenic Trail, except for required and designated crossings. Those portions of the hiking trail that currently follow established ORV trails would be relocated to better separate the two uses. ORV use would not be permitted on any new mineral access roads. Without this restriction, improved mineral roads could significantly increase and concentrate recreational use in previously remote areas and consequently cause unacceptable resource impacts. If a new mineral access road or pipeline displaced an established ORV trail, a new or alternate ORV trail to the affected area would be provided, to the extent possible, without causing adverse impacts on important resource areas.

ORV Access. ORV management strategies for each planning unit are described below (see the ORV Management map). Two strategies would be used to control access: ORVs would be restricted only to designated trails in two units; and ORV use would be more dispersed in two units, with more existing trails and larger areas being designated open to ORVs. The other two units would be closed to ORV use. No ORV access would be proposed for the 1-75 corridor within the preserve boundaries. Research by the National Park Service and the Florida Game and Fresh Water Fish Commission indicates that the northern portion of the preserve, through which the interstate will pass, has the highest concentration of Florida panthers in Big Cypress. ORV access off I-75 would be likely to encourage and concentrate ORV activity in that area.

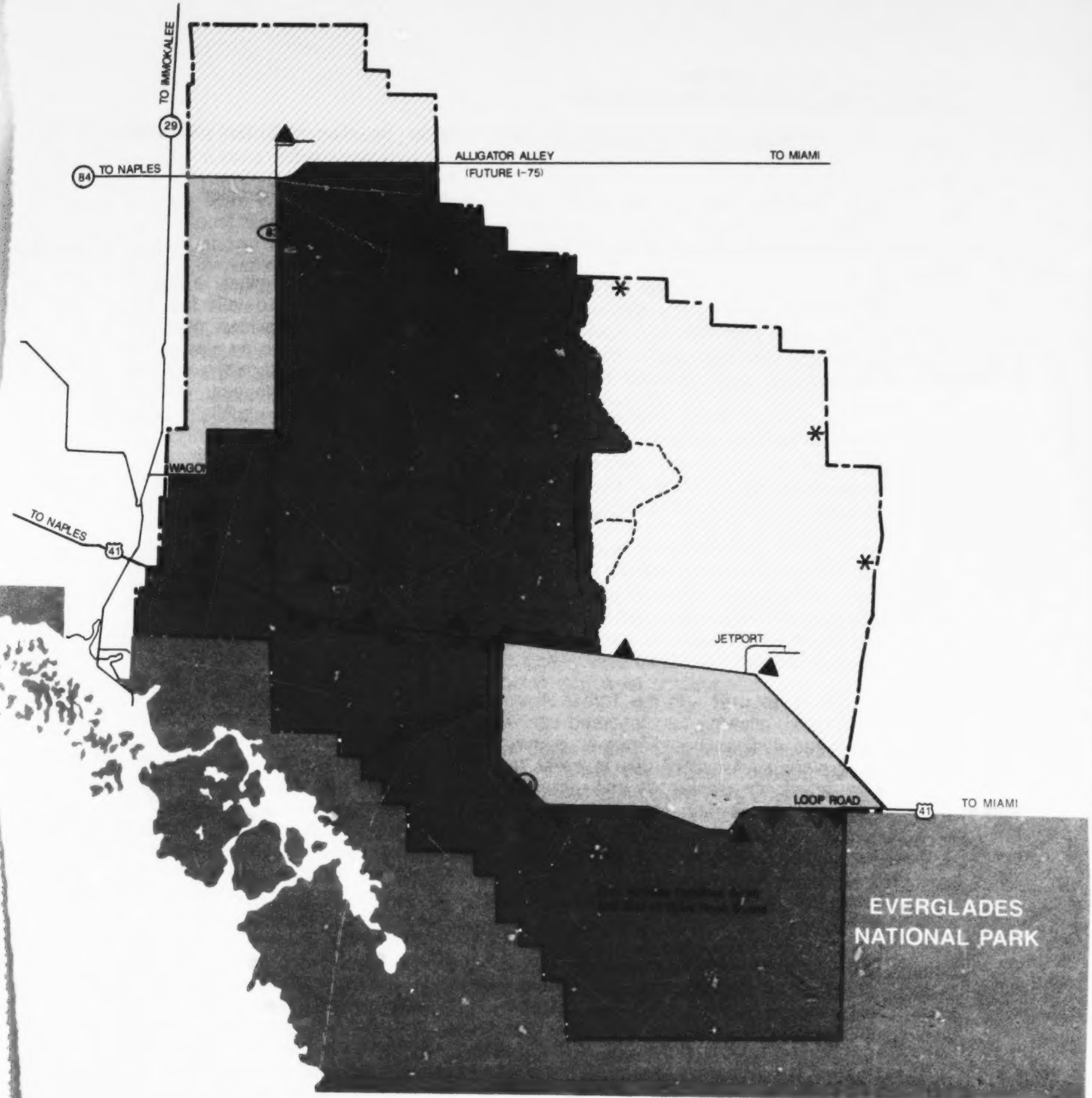
Because resource concerns and impacts can vary over time specific ORV trails and areas would be designated through the "Superintendent's Compendium" process authorized by 36 CFR 1.5 and 1.7. Therefore, the mileages noted under the description of each unit below are only approximations. Since public law and executive orders emphasize resource protection, guarantees cannot be made on specific mileages or areas. Before any trails or areas were designated, people who are knowledgeable about specific trails and areas would be consulted, and inholder needs and resource protection methods would be considered. Future resource concerns might require changes in designated access points.

Bear Island unit – As previously described, the Bear Island unit has one of the highest concentrations of important resource areas in the preserve. It is particularly rich in inland marshes and hardwood hammocks, and it supports probably the healthiest remaining population of Florida panthers in Big Cypress. Therefore, ORV use would be limited solely to designated trails to contain potential disturbance to panthers, to control hunting pressure on panther prey (deer and hogs), and to protect important resource areas.

A network of approximately 60 to 80 miles of ORV trails, including oil and gas roads, would be posted for ORV use. This would provide wide circulation within the unit, and most of the area should be within 1 mile of an ORV trail or road, with no area farther than 2 miles from a trail. Grazing lessees and their employees working with cattle and range management would be the only exceptions for using ORVs off-trail. The following criteria would be applied to determine which trail segments or areas should be closed to ORVs:

Vehicle use causes or would cause extensive ponding or erosion.

Soils, vegetation, wildlife, or wildlife habitat are or would be adversely impacted.


TO IMMOKALEE
29
84
TO NAPLES
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
WAGO
TO NAPLES
41
JETPORT
LOOP ROAD
41
TO MIAMI
EVERGLADES
NATIONAL PARK

✱ Boundary Entry Point

▲ Developed ORV Access Point

△ Unimproved ORV Access Point

● Road Shoulder ORV Access

▒ Closed to ORV Use

▨ Designated Trails Only

■ Dispersed Use: Designated Trails and Areas

ORV MANAGEMENT

PROPOSED ACTION

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,021-A

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Multiple trails cut through sloughs, strands, or other important resource areas.

Cultural resource sites might be threatened by vandalism or erosion.

Other chronic resource problems are evident.

Access to the unit for the general public would continue to be limited to Turner River Road (Collier Co. 839). A parking and staging area for 10 vehicles and trailers, with potential expansion up to 30 spaces, would be provided near the Bear Island campground at the entrance to Perocchi Grade. Access by way of the Bear Island Road would continue to be limited to the following authorized entities: grazing lessees and their employees, petroleum industry employees, mineral owners whose lands are in active exploration or production, public utilities providing service within the unit, and government officials.

Deep Lake unit – This unit would not be open to ORV use because of the important resource areas and documented panther habitat, the unit's proposed designation as a bow hunting area, and the concern for illegal and unchecked hunting, which probably greatly reduced the deer herd in this unit. In the past game laws have been difficult to enforce because of the unit's ready accessibility from surrounding roads and highways. The proposal to prohibit ORV use in Deep Lake would also better protect Florida panthers by reducing hunting pressure on panther prey species and reducing potential disturbance from ORV use to documented panther habitat.

Turner River unit – In the Turner River unit both ORV trails and areas would be designated, allowing for dispersed use. Many existing trails would be incorporated into these designations. However, some existing trail segments or areas would not be designated for ORV use in order to control impacts on soils and vegetation. The criteria for closure of trail segments or areas would be as described under the Bear Island unit. In some cases designated segments could be raised or corduroyed to provide a firmer treadway and to control damage to soils and vegetation. Care would be taken at such sites to accommodate sheet flow across or beneath the trail. In some cases, heavily damaged areas would be actively reclaimed through plantings, restoration of soils, or removal of obstructions to sheet flow.

Proposed ORV access points in the Turner River unit are shown on the ORV Management map. North of US 41 and east of the Turner River Road, six existing ORV access points would be upgraded to include a new canal bridge and a staging/parking area for five to 10 vehicles and trailers; two other existing unimproved access points would be retained. On the west side of Turner River Road, 11 existing access points off Turner River Road, Wagonwheel Road, and Birdon Road would be retained as designated ORV accesses, but no new facilities would be provided. The purpose of improving staging and parking areas off US 41 and Turner River Road and of designating other access points in the unit would be to improve visitor safety by reducing the need for slow-moving ORVs to cross relatively high-speed vehicle roads. These actions would also allow improved monitoring of ORV use and backcountry activities, and they would ensure better control of resource impacts from such use.

Corn Dance unit – Similar to the Bear Island unit, ORV use in the Corn Dance unit would be limited solely to designated trails to control potential disturbance to known Florida panther habitat and to aid in controlling illegal hunting activity. The network of designated trails would be broad, incorporating many major existing trails, and would total approximately 90 to 120 miles.

ORV access would be continued to all exempt inholdings in the unit (approximately 30). Designated trails would connect with selected, established trails on the preserve boundary to the northeast, along levee 28, and from the Jetport, depending on agreements with affected landowners and government agencies.

Loop unit – To maintain its primitive character, the Loop unit would continue to be closed to ORV use and retained for walk-in primitive hunting. The unit would also be used as a control zone for comparing the extent of ORV impacts in other areas of the preserve.

Stairsteps unit – Because ORV impacts can be directly associated with water levels and soil types (Duever et al. 1981; Duever et al. 1986a), ORV management in the Stairsteps unit would be different to the north and west of Gator Hook Strand than to the south and east. To the south and east of the strand, marsh and wet prairie vegetation are dominant, and soils often remain saturated, even through the dry season. To the north and west of Gator Hook, soils tend to dry more readily.

Consequently, north and west of Gator Hook Strand specific trails and areas would be designated for ORV use, similar to the use proposed for the Turner River unit. Some designated segments in the northern portion of the unit could be hardened or corduroyed to accommodate wheeled ORVs and to reduce damage to soil and vegetation. Care would be taken at such sites to avoid interference with sheet flow or to unnecessarily inhibit airboat use of the site in higher water. Existing trails or areas where sustained resource damage has occurred would not be designated as open to use so that the resources could recover (see the description of criteria under the Bear Island unit).

South and east of Gator Hook Strand, trails and areas would also be designated for dispersed ORV use; however, only airboats would be allowed in this portion of the unit because of the important resource areas, soils, and water levels. Special access permits would be issued to landowners of exempt inholdings within this unit. These permits would allow the use of wheeled vehicles for access along the most direct designated route to and from owners' inholdings. The determination as to which trails and areas would be designated would be consistent with criteria already mentioned.

Four existing ORV access points (primarily for airboats) would be upgraded to include a parking/staging area for five to 10 vehicles and trailers. These access points are at the end of Dona Drive near Ochopee and off the Loop Road at Sig

Walker Landing, Red Bird Lane, and County Line Trail. Four other existing ORV access points on the Loop Road would be retained as designated accesses, but they would not be upgraded. Road shoulder parking on the south side of US 41 would be permitted at seven designated access points. Conversely, vehicle parking and unloading of ORVs would not be permitted at undesignated sites.

Other Recreational Activities

Camping. To provide visitors a more convenient opportunity to see and use the preserve, and to improve public health and environmental quality, six primitive frontcountry campgrounds would be formally established. At four areas (Fifty Mile Bend, Monument Lake, Burns Lake, and Bear Island) camping has occurred on an informal basis, and campsites would be designated and upgraded. At two sites (on Red Bird Lane near the Loop Road interpretive center and along Dona Drive at Ochopee) new campgrounds would be established.

The spacing and design layout would support the social experience that has become associated with camping in Big Cypress. Sites would be available on a first-come, first-served basis. Hunters would most likely use these sites during fall, and other regional and national tourists would use them during the winter and spring.

Group camping (for example, school groups) would also be an addition to the types of uses now occurring in the preserve. Sewage dump stations for trailers and recreational vehicles would be provided at each campground, as would water, self-contained toilets, picnic tables, grills, and garbage cans. Informal camping currently allowed at the Midway fill-pad on US 41 would be discontinued, and the site would be reclaimed.

Backcountry campsites would be designated in the Deep Lake, Bear Island, Corn Dance, and Stairsteps units. Use levels would be monitored so data could be collected to determine appropriate use levels in important resource areas. The Deep Lake, Bear Island, and Corn Dance units are known panther areas, so campsites would be designated to reduce human intrusion and to limit the extent of the area affected. (This action would comply with recommendations made by both the Florida Panther Technical Advisory Council [1985] and the U.S. Fish and Wildlife Service [1981].) Game checks would also be conducted regularly at designated campsites to more accurately gather hunting data about deer and hogs. In the Stairsteps unit scattered hardwood hammocks provide the only dry sites for year-round camping. Because hardwood hammocks are identified as an important resource area, campsites would be designated to protect hammocks from overuse.

Backcountry camping would also be allowed in the Turner River and Loop units, but sites would not be designated. Campsites in both these units would be temporarily closed to allow recovery if areas were threatened by overuse.

Hunters, ORV users, and other recreationists who do not own improved properties have relatively few opportunities to stay overnight in the backcountry. Approximately 50 backcountry shelters would be constructed (phased over time according to demand) to provide for public use in remote areas of all six units. Only a portion of the designated backcountry campsites would have shelters. The shelters would be screened and elevated and would be of various designs to accommodate four to six people plus equipment. Shelters could either be isolated or arranged in small clusters. Backcountry shelters could be used on a reservation basis. If a concession guide operation was established to provide a year-round outfitter service, the concessioners would also be able to reserve shelters.

Canoeing. Two designated canoe trails would be developed for day use. These would give more adventurous visitors a unique opportunity to view Big Cypress close at hand. The Forty Mile Bend canoe trail would provide about 4 miles of canoeing along the edge of a cypress prairie. It would follow a narrow canal that parallels the north side of US 41 near the preserve's eastern boundary. Visitors could make an optional side trip along a canal that parallels levee 28. Two small parking/staging areas would be developed at each end of the trail so visitors could shuttle their canoes from one point to another.

A canoe trail would be provided in either the Turner River canal or Turner River, with the actual location depending on the effects of the Turner River restoration project on water flows (see the hydrology section of "Natural Resource Management"). A picnic chickee would be provided at a convenient location downstream so visitors could stop and rest before the return trip. Canoeists would also have the option of canoeing Turner River to Everglades City or connecting with the Wilderness Waterway in Everglades National Park. A small parking/staging area would be developed next to US 41, near the Turner River bridge.

Hiking. Interpretive trails would offer short-distance hiking opportunities. Long-distance hiking would be provided on the Florida National Scenic Trail. A secondary connector trail (compass course) from the Oasis visitor center through the Loop unit would end at a proposed trailhead/parking area on the Loop Road. To help ensure visitor safety, a reduced speed zone and signed pedestrian crosswalk on US 41 would be established near the visitor center.

The trailhead for the Florida National Scenic Trail at the Oasis visitor center would be moved to the east side of the building so hikers would not be near the landing strip and aviation fuel area; the existing trail would be allowed to revegetate. The visitor center would be the terminus of the trail. Trail marking and maintenance would continue to be provided in cooperation with the Florida Trail Association. ORVs would be prohibited on the trail, and crossings for ORVs would be designated. Some portions of the Florida trail currently follow actively used ORV trails, but these sections are wet and rutted much of the season, making them poor hiking trails. The national scenic trail would be rerouted along these segments to separate them from the ORV trail in order to improve visitor safety and the quality of the experience for both groups of recreationists.

Picnicking. Two existing roadside parks along US 41 – Kirby Storter and H. P. Williams – would continue to offer picnic areas. These parks are managed and maintained by the Florida Department of Transportation.

A new picnic area with shade structures would be developed a short distance east of the Oasis visitor center and next to the canal on the north side of US 41. A short, elevated boardwalk along the canal would be included in the design for the picnic area.

Recreational Access off I-75. The Florida Department of Transportation has proposed a recreational rest area near mile-marker 31 on I-75 within the original preserve. This would provide public access to the roadside canal on the north, and the National Park Service would cooperate with the state to permit pedestrian access north and south of this location.

Concessioner Services

A concessioner would be sought to provide on-site visitor services and facilities that would complement those provided by the National Park Service. The concessioner would be asked to provide airboat and swamp buggy rides, canoe rentals, backcountry shelter rentals, backcountry guide and outfitter services for hunters and nonhunters, ORV storage and maintenance facilities, convenience store facilities, and restrooms. One possible location for the primary concessioner operation would be at Pattons, which is adjacent to a network of designated ORV trails that would provide visitors an opportunity to explore a large part of the preserve north of US 41 (see Proposed Development map).

Visitors would be able to rent canoes for use on the two proposed canoe trails, or they could take short guided interpretive trips into the backcountry on swamp buggies. Visitors with more time could rent swamp buggies for extended stays (outfitter services) at backcountry rental shelters. Storage facilities would be provided for visitors who own ORVs, thus eliminating the need to haul these vehicles to and from the preserve on trailers. The concessioner would also provide buggy and airboat maintenance services, as well as convenience store items, gas, and restrooms.

A satellite concession center could be provided at Seagrape Canal near Ochopee. From this site short interpretive airboat tours could be provided into the preserve's remote prairies and marshes. These trips would provide an experience that would be very different from a short excursion on a man-made canal. Overnight airboat trips (outfitter services) could also be provided into the backcountry south of US 41.

Visual Corridors

Visual corridors and viewsheds from major roads and facilities are regarded as important elements of the visitor experience, and the maintenance of unimpaired, natural scenes would be essential to the visitor experience under the proposed action. A visual corridor would be established along each side of US 41, Florida 84, and the Loop Road. A viewshed would be established at the interpretive stops along Loop Road, the Loop Road interpretive center, the Oasis visitor center, Kirby Storter Roadside Park, H. P. Williams Roadside Park, the East Hinson Marsh boardwalk, and campgrounds. Within these corridors and viewsheds no activity that adversely affected the natural scene would be allowed. The extent of a roadside corridor or a viewshed around a facility would vary according to site-specific conditions. For example, in some instances, an activity could be allowed close to a roadway if a cypress strand blocked the view of the activity from the road. In another instance an activity in an open grass prairie might have to be at least 1 mile from the road so that it would not be seen. The superintendent would establish viewsheds and corridors for the areas mentioned.

NATURAL RESOURCE MANAGEMENT

Hydrology

In accordance with the preserve's legislation, NPS policies, and executive orders 11988 ("Floodplain Management") and 11990 ("Protection of Wetlands"), one of the most important functions of the proposals in this plan is to ensure continuous natural water flows and water quality to maintain the ecological integrity of both Big Cypress and the Everglades. Because the preserve boundary (prior to the enlargement of the preserve in 1988) encloses most of a single watershed (approximately 5 percent of the preserve lands are outside the Big Cypress watershed), the National Park Service has considerable control over surface flow and water quality in the preserve. Factors affecting the preserve's hydrology that are of particular concern include oil and gas developments, general development, I-75 construction, roads and canals that have obstructed water flows and increased agriculture along the preserve's northern boundary.

Under the proposed action the overall direction of hydrological management within the preserve would be to maintain and restore, to the extent feasible, natural water flows and water quality in disturbed areas and to avoid further hydrological disturbance to the Big Cypress watershed. Management programs would include (1) continuation of monitoring to identify and quantify existing problems and future threats to water resources, (2) regulatory actions to prevent or mitigate new intrusions, and (3) rehabilitation projects to alleviate existing hydrological problems.

Monitoring. The recently established preservewide network of water monitoring stations would continue to provide baseline hydrological data and early warnings of problems. The program consists of monitoring stations established at strategic locations across the entire preserve. Some stations would provide baseline water quality and quantity information, others would monitor the impacts of specific land use activities occurring within and outside the preserve (as mentioned previously in the "Natural Resource Issues" section), and still other stations would monitor the effectiveness of the proposed Turner River restoration project. Selected parameters measured at all stations include temperature, specific conductance, pH, dissolved oxygen, orthophosphorus, several elements, and water level (on a continuous basis). As a tool to protect existing water quality conditions, water quality standards to prevent degradation have been developed and are outlined in the preserve's draft hydrological monitoring program.

Regulatory Actions. To address NPS concerns about water quality and quantity within the preserve, water rights for specific surface waters and groundwaters would be clarified with the appropriate state, local, and federal agencies.

Ongoing and future oil and gas activity would be regulated to avoid or mitigate disturbance to water quality and flows. Abandoned or closed roads, pads, and pipelines would be reclaimed to restore hydrological values. (Methods of management and reclamation are discussed under the "Minerals" section and in appendix C.)

The National Park Service would continue to consult with the Collier, Dade, and Monroe county governments, the Florida Departments of Environmental Regulation and Natural Resources, the South Florida Water Management District, and the U.S. Army Corps of Engineers in the review of building and development permits for projects on private lands within the preserve and on lands adjacent to the preserve when water quality within the preserve could be affected. Permit applications would be closely examined to ensure the protection of the preserve's hydrological integrity.

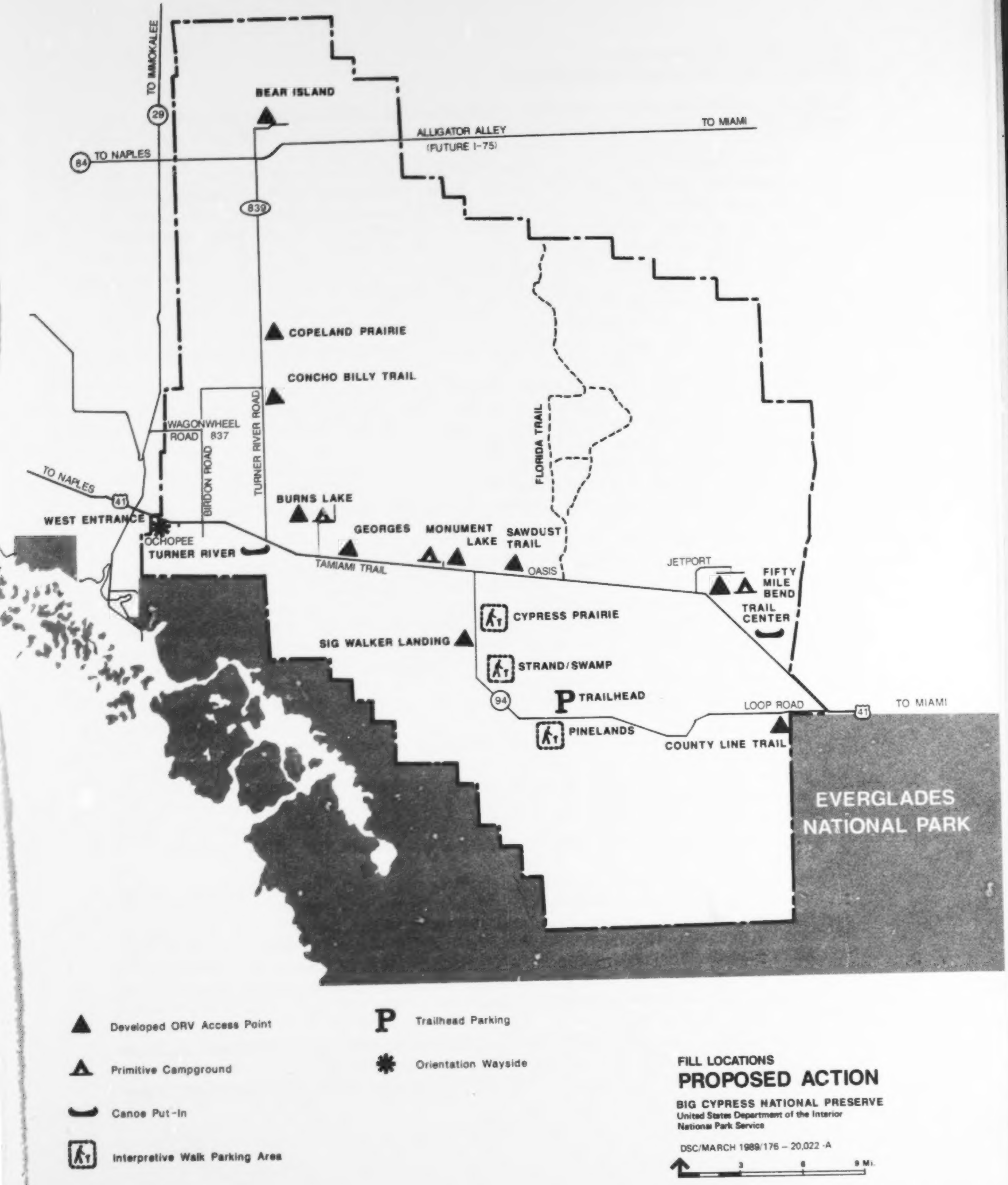
If a proposed improvement or use on a private property within the preserve boundary was shown to pose a threat to water resources (or other values described in the establishing legislation), the National Park Service would advise the property owner in writing of needed corrective measures and would cooperate with the owner to remedy problems to the extent allowed by the agency's authority. If corrective measures were not taken in a reasonable amount of time and the threat to preserve resources persisted, then the National Park Service would initiate condemnation procedures, as directed by the enabling legislation.

The National Park Service would continue to avoid to the extent feasible further occupation or modification of floodplains and wetlands, in accordance with Executive Orders 11988 and 11990. The construction of NPS administrative, maintenance, and permanent housing facilities would be restricted to existing filled or disturbed upland sites at Ochopee, Oasis, and Pinecrest (see the "General Development" section) to minimize any effects on water resources and further occupation of wetlands. However, some filling would be necessary at several proposed visitor facility sites. Fill would probably be needed at 10 proposed ORV staging areas and seven parking areas along US 41, the Loop Road, and Turner River Road. Most of the filled areas would be less than 0.5 acre and would require no more than 2,500 cubic yards of material per site. Some additional fill would also be needed to improve existing campgrounds. The total quantity of fill material is estimated at 7 acres (see Fill Locations map), in comparison with proposed rehabilitation projects that would restore surface flows to roughly 38,000 acres.

No new dredging or further excavation of previously dredged sites within the preserve would be conducted for fill material for proposed NPS developments. To the extent feasible, existing spoil piles within the preserve would be used as fill sources so that these piles could be removed as hydrological obstructions or as refuges for exotic plants. The pile sites would be returned to original contours. Where obtaining spoil material from within the preserve was impracticable, fill would be obtained from state and EPA approved sources outside the preserve. Where available, such fill would be acquired through cooperative agreements with regional agencies to reduce abandoned levees and other spoil areas that are hydrological obstructions.

During all NPS construction activities care would be taken to protect hydrological values. Turbidity would be controlled during construction by silt screens or other approved methods. To the extent feasible, parking areas would be designed to maximize percolation and filtration of storm water by using pervious surfaces. Fill operations would comply with the permit requirements of section 404 of the Federal Water Pollution Control Act, chapter 253 of the Florida Statutes, and chapter 17 of the Florida Administrative Code.

The National Park Service would continue to maintain an emergency evacuation plan in order to protect human life and property during a hurricane or other storm. The evacuation plan details responsibilities and procedures for securing government facilities.


TO IMMOKALEE
29
BEAR ISLAND
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
84
TO NAPLES
839
COPELAND PRAIRIE
CONCHO BILLY TRAIL
WAGONWHEEL ROAD 837
BIRDON ROAD
TURNER RIVER ROAD
FLORIDA TRAIL
TO NAPLES
41
WEST ENTRANCE
OCHOPEE
TURNER RIVER
BURNS LAKE
GEORGES
MONUMENT LAKE
SAWDUST TRAIL
TAMIAMI TRAIL
OASIS
JETPORT
FIFTY MILE BEND
TRAIL CENTER
CYPRESS PRAIRIE
SIG WALKER LANDING
STRAND/SWAMP
94
TRAILHEAD
LOOP ROAD
41
TO MIAMI
PINELANDS
COUNTY LINE TRAIL
EVERGLADES NATIONAL PARK
Developed ORV Access Point
Primitive Campground
Canoe Put-In
Interpretive Walk Parking Area
P Trailhead Parking
Orientation Wayside
3
6
9 Mi.

FILL LOCATIONS

PROPOSED ACTION

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

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Rehabilitation Projects. In addition to preservewide hydrological management, the following actions would be taken to restore selected areas.

Turner River / Deep Lake Strand restoration – The recommendations of the *Water Management Plan: Turner River Restoration* (NPS, Rosendahl and Sikkema 1981d) would be implemented to mitigate the existing adverse effects of the Turner River canal and the Birdon Road canal. The Turner River canal was constructed in 1960 to provide fill for the adjacent Turner River Road (Collier County 839). However, the canal inadvertently created a hydrological link between Deep Lake Strand and Turner River and the saline Chokoloskee estuary within Everglades National Park. Birdon Road and its adjacent borrow canal were constructed in the late 1960s and early 1970s. The canal interrupts sheet flow in surrounding wet prairies and diverts water into drainage canals in the Ochopee area.

As described in the restoration plan, the Turner River canal alters surface flow patterns, lowers the water table, and reduces the hydroperiod 65 percent of the time on 3,000 acres adjacent to the canal. Furthermore, the canal provides an access route for saltwater intrusion and separates the Turner River from its natural flow basin. The effects of the Birdon Road canal are less extensive, but the water table has been lowered and the hydroperiod reduced in adjacent wetlands.

The proposed action would require the installation of 11 plugs and six culverts in the Turner River canal and eight plugs and two culverts in the Birdon Road canal. The project would be accomplished in two phases: Under phase 1 flows in Turner River would be restored, and under phase 2 flows at Deep Lake Strand and the wet prairies adjacent to Birdon Road would be improved. This project would be a high priority for hydrological management in the preserve.

Loop Road mitigation – Water is impounded on the north side of the Loop Road during high water, and segments of the road are commonly overtopped (Schneider and Flora 1986). This condition is unnatural and is caused by inadequate drainage under the roadway. Furthermore, impoundments caused by the Loop Road, particularly at Pinecrest and eastward, have been exacerbated by increased water deliveries from conservation area 3A into levee 29 (see "Affected Environment"). The South Florida Water Management District is collecting water level data to better understand the effects of the Loop Road.

To correct this problem a hydrological/engineering study of the drainages in the vicinity of the Loop Road would be conducted to identify requirements for adequate drainage. Hydrological improvements would likely include refurbishing existing drainage structures and possibly installing additional structures. The road surface would be improved, but the alignment and width would not be changed. Improvement designs and roadwork would be coordinated with Dade, Monroe, and Collier counties, the owners of the road.

Paces Dike, a low berm surrounding 1,340 acres, is adjacent to and south of Loop Road. The dike has been identified as a lesser hydrological obstruction that could be mitigated by breaching the berm at several points (Schneider and Flora

1986). The hydrological/engineering study would also address Paces Dike, and any proposed actions would be undertaken as part of the Loop Road rehabilitation project.

Bear Island Road mitigation – Bear Island Road was originally constructed as a logging tram road and was upgraded as an access road for oil development. The road generally follows a divide between Okaloacoochee Slough and East Hinson Marsh. (The Okaloacoochee Slough, which drains developed areas to the north, traverses a small area of the northwest corner of the preserve.) There is a limited exchange of water during high water periods between the two drainages through culverts beneath Bear Island Road. The amount of water exchange before the road was constructed is unknown, and the present flow through culverts under the road has not been measured.

The quantity and quality of water exchanged between Okaloacoochee Slough and East Hinson Marsh would be assessed as part of the preservewide monitoring program. If hydrological problems were identified, actions would be taken to ensure the integrity of East Hinson Marsh. Either culverting under Bear Island Road would be improved for water exchange, or if water quality in Okaloacoochee Slough was found to be degraded, then flows under the road would be restricted to protect East Hinson Marsh.

Cleanup of acquired tracts – At present over 150 tracts with abandoned structures or fill pads have been acquired by the National Park Service. The structures are of little or no value to the preserve and have been vandalized or partially dismantled, leaving them in an extremely unsafe, unsanitary, or unsightly condition. Many are on limerock fill pads 2 to 3 feet above normal ground level, and several have filled access roads (totaling approximately 30 miles) that may locally impede the flow of surface water in the wet season. Furthermore, many of the abandoned structures contain fuel tanks, herbicide containers, waste oil cans, and other potentially hazardous materials that could adversely affect water quality.

Under the proposed action materials on these sites would be removed and properly disposed of outside preserve boundaries. Fill pads and roads would be breached or removed to restore more natural surface flows. At sites where there are known or potential archeological resources, the National Park Service will consult with the state historic preservation officer before cleanup activities are begun in order to avoid disturbing cultural resources.

Minerals

Under the proposed action for minerals management, oil and gas exploration and development would be allowed to continue within the preserve under certain restrictions. As directed by the enabling legislation, this development would be regulated and controlled to protect important resource values, to prevent undue degradation of soils and vegetation, and to minimize conflicts with visitor use and safety. Oil and gas operations would be managed as described below:

Establishing an acceptable level of exploration and development based on an area of influence – At any one time, only 10 percent of the preserve could be subject to the influences of oil and gas exploration and development activities. Protecting 90 percent of the preserve from such effects would help avoid jeopardizing the preserve's primitive character.

Determining the management action for each management unit – Geophysical operations would be permitted throughout the preserve, subject to certain regulations. Future exploratory drilling and production operations would be permitted in all units except Bear Island, where such operations would be permitted only from existing roads and pads.

Protecting important resource areas – Surface occupancy for exploratory drilling and production would be permitted only outside important vegetation and cultural resource areas. Geophysical operations would be permitted in these areas, subject to the stipulations identified in the minerals management plan (see appendix C) and subject to the proposed ORV regulations. Mineral resources beneath environmentally sensitive resource areas could be explored and extracted by using state-of-the-art techniques, such as directional (slant) drilling.

Implementing the minerals management plan – Oil and gas exploration and development would be subject to the procedures outlined in the minerals management plan (see appendix C).

Acceptable Level of Exploration and Development Based on Area of Influence. The determination of an acceptable level of oil and gas exploration and development was based on an area of influence concept. The area of influence is defined as the total area directly affected (for example, by removal of vegetation, topographic alteration, and soil compaction) and the adjacent area indirectly affected (for example, by hydrological changes, water quality degradation, noise effects on wildlife, and adverse effects to vegetation resulting from spills). For the purposes of this plan, the area of influence has been determined to extend 0.5 mile on any side of an access road, well pad, pipeline, or ongoing geophysical survey operation. Nine criteria were identified and evaluated to determine the area of influence associated with oil and gas exploration and development operations. These criteria are described in appendix B.

Applying the 0.5-mile area of influence to existing oil- and gas-related disturbance shows that approximately 38,458 acres, or 6.7 percent of the preserve, is currently being adversely influenced. If present oil and gas exploration and development trends were to continue (as described in the oil and gas development scenario for the status quo alternative), an additional 38,036 acres (6.6 percent of the preserve) could be subject to influence by oil and gas operations. Therefore, the total area of influence under existing trends would amount to an estimated 76,494 acres, or 13.3 percent of the preserve.

An assessment of whether or not this level of influence is acceptable was made by a comparative analysis of environmental consequences and risks associated with existing oil and gas disturbance in the Bear Island and Corn Dance units. The assessment suggests that the maximum area of influence related to oil and gas exploration and development in Big Cypress should not exceed 10 percent (57,444 acres) at any given time in order to ensure resource protection and ecosystem preservation. Application of the 10 percent limit would allow for 18,956 acres of additional influence from oil and gas exploration and development, which equates to approximately 143 acres of additional direct disturbance to the surface.

To put this in perspective, the 10 percent area of influence limit would currently allow for the development of two additional oil production fields slightly smaller than the Raccoon Point field, assuming that no existing abandoned sites in the preserve were reclaimed. Proper reclamation of abandoned access roads and pads would allow for equivalent development elsewhere, as long as the 10 percent area of influence limit was not exceeded.

For geophysical surveys, the 10 percent area of influence limit would mean that a 29.6-mile survey line could be put in place, which would indirectly influence 18,956 acres (1 mile of survey line would influence 640 acres). Following completion of the survey, the area directly affected by geophysical activities would be reduced to the width of the survey line, or approximately 38 acres, based on a 10-foot-wide line. The area of direct impact would be less because significant changes in topography should not occur, surface water flow should not be significantly impeded or altered, and direct wildlife disturbance would cease when the area was vacated. This reduction in the area influenced would allow for subsequent placement of a survey line of approximately the same length. Limitations on additional geophysical operations would be based on this method. Any area of direct impact that was properly reclaimed would be deleted from the total area influenced. It is important to reiterate that when the total area of influence – including unreclaimed and active operation sites – reached 10 percent of the preserve, or 57,444 acres, then approval of additional oil and gas operations would be delayed until other sites were reclaimed. Proper reclamation of sites would allow new development to be permitted as long as the 10 percent limit was not exceeded.

Management Units. Natural resources to the north of US 41 differ from those to the south in terms of their sensitivity to oil and gas activities. The Deep Lake, Turner River, and Corn Dance units, which are north of US 41, tend to have shorter hydroperiods, and dispersed important resources occupy about 38 percent of the area. The Loop and Stairsteps units, which are south of US 41, contain resources that are much more sensitive to mineral activities. Important resource areas are highly concentrated and cover approximately 60 percent of the area. In addition, most of the remaining area in these two units is frequently covered by surface water that drains directly into one of the most pristine areas of Everglades National Park, with few natural or man-made barriers impeding its flow. Other portions of these units are surrounded by important resource areas. Access to these areas for mineral exploration or production might be difficult or impossible without adverse impacts on the important resource areas or Everglades National Park.

Under the proposed action geophysical activities would be permitted throughout the preserve, in accordance with the stipulations in the minerals management plan and subject to the proposed ORV regulations.

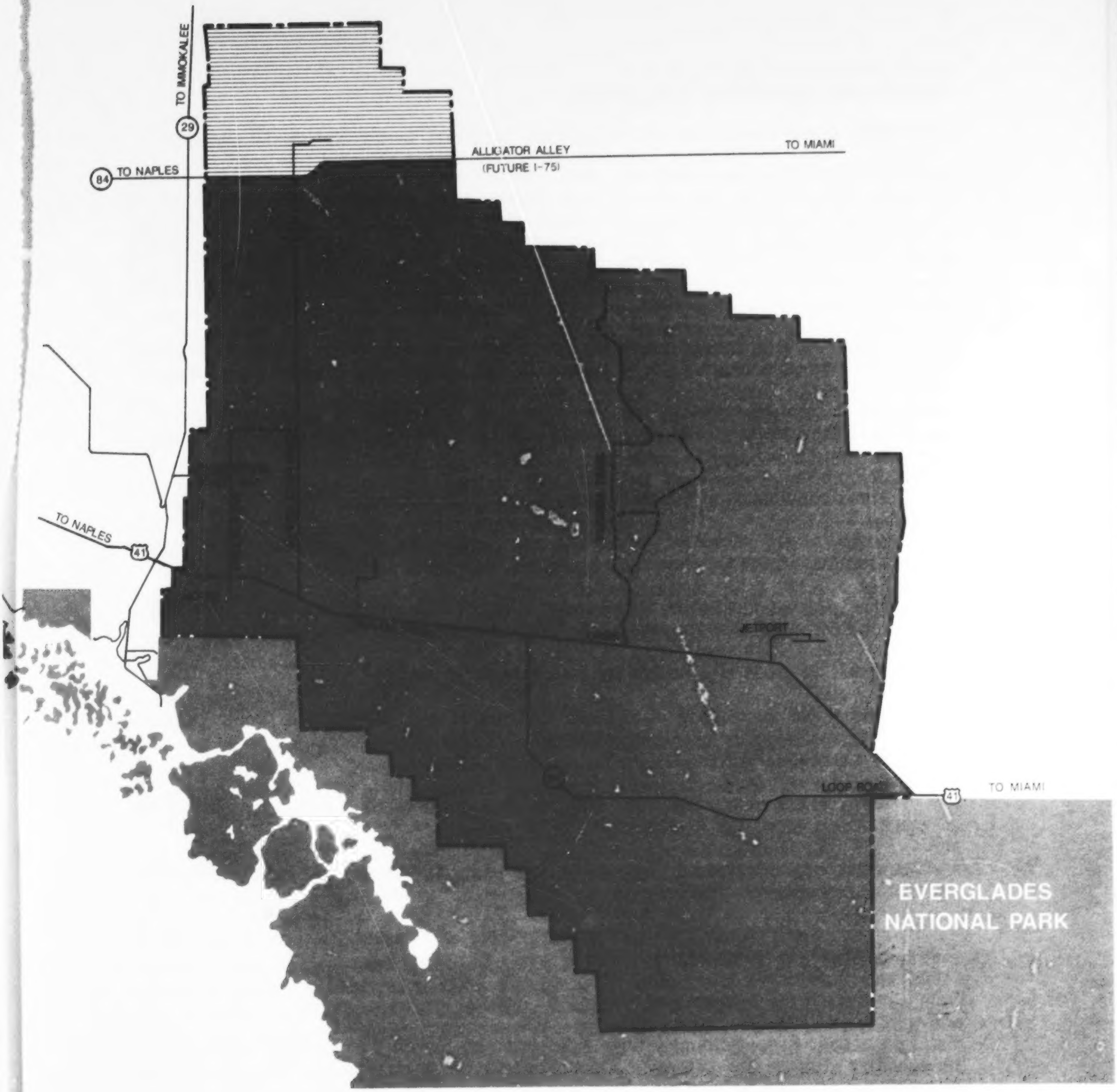
Exploratory drilling and production operations could be permitted in all units except Bear Island, subject to the protection of important resource areas, the adherence to stipulations in the minerals management plan, and proposed ORV regulations. Future exploratory drilling and production operations in the Bear Island unit would be permitted only from existing roads and pads to ensure the protection of one of the highest concentrations of important resource areas in Big Cypress. This unit has already been heavily disturbed by oil and gas development (31.6 percent of the unit has been influenced). Allowing additional activity in unimpacted areas would not achieve the legislative mandate established by Congress for Big Cypress.

To protect the important resource areas and other sensitive resources in the preserve, nonfederal subsurface interests might have to be acquired. Such acquisition would be more likely in the units south of US 41. To determine the need for such acquisition in any portion of the preserve, mineral trends, activities, and technological advances in extraction techniques would be monitored. If private oil and gas could be extracted by means that would not create adverse impacts on the preserve, then a plan of operations could be approved and the oil and gas rights might not have to be acquired.

In the event the National Park Service rejects a plan of operations because it would be detrimental to the purposes of the preserve or because of anticipated unacceptable levels of environmental impact resulting from such operations (i.e., the existing regulations cannot provide the level of protection necessary) and the denial is viewed as a potential for the taking of property interests, funds will be sought from Congress to acquire the affected mineral estate. If funds are not made available for acquisition within a reasonable period of time, the oil and gas operation will be allowed to proceed under reasonable rules and regulations.

Important Resource Areas. Under the proposed action, the important resource areas described in the "Planning Perspective" section would be fully protected from oil and gas drilling and production operations, including access road construction. Geophysical exploration activities would be permitted in these areas for the operations conducted in accordance with the stipulations in the minerals management plan and subject to proposed ORV regulations.

Minerals Management Plan. The minerals management plan is an implementing action plan for the general management plan, and it specifies the strategies that the National Park Service would adopt to manage the development of nonfederal oil and gas rights over the next 10 years. The plan is based on NPS regulations at 36 CFR 9B, which control all activities in the exercise of rights to oil and gas not owned by the United States where access is on, across, or through federally owned or controlled lands or waters. The plan details procedures and requirements for issuing oil and gas permits, environmental reviews of plans of operations, monitoring of operations, stipulations and conditions for operations, and reclamation. These procedures and requirements under the proposed action would apply to oil and gas operations subject to NPS regulations both within and outside important resource areas.


TO IMMOKALEE
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TO NAPLES
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
TO NAPLES
41
JETPORT
LOOP ROAD
41
TO MIAMI
EVERGLADES NATIONAL PARK

■ Regulated Exploration and Development; Important Resource Areas Protected

▤ Regulated Exploratory Drilling and Production Restricted to Existing Roads and Pads; Important Resource Areas Protected

MINERALS MANAGEMENT

PROPOSED ACTION

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

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Vegetation

Protected Species. Seventy-three plant species that are under review for federal protection are protected by the state of Florida, or are listed by the Convention on International Trade in Endangered Species (see tables 20 and 21 in the "Affected Environment" section) would continue to be protected in the preserve. These species would benefit from the maintenance of natural water regimes, prescribed burning (an estimated 50,000 acres per year) and management of wildfires, control of exotic species, and protection from illegal taking.

Exotic Species. The highest priority for exotic plant control programs within the preserve would be melaleuca control, followed by control of Australian pine and Brazilian pepper.

Eliminating melaleuca from the preserve would be a long-term goal. Actions to control and reduce the spread of this exotic would include treatments of the following areas (by priority):

> areas contributing to the continued expansion of melaleuca
>
> areas where important resources are threatened by melaleuca, particularly essential habitat for protected species and significant cultural resource sites
>
> areas where melaleuca stands conflict with visitor use, particularly along major road corridors where scenic quality is jeopardized
>
> remaining areas to eliminate seed sources for reinvasion

The potential for eliminating Australian pine within the preserve is good because populations are fairly isolated and expansion is slow. Priorities for treatment by area would be as follows:

> areas where windthrown trees and branches could cause a threat to visitor safety (primarily along US 41 and other roads)
>
> areas where important resource values were threatened, particularly significant cultural resource sites
>
> areas where Australian pines could conflict with visitor use, especially scenic quality along major road corridors
>
> remaining areas to prevent reinvasion

Brazilian pepper is so thoroughly naturalized in south Florida that it would be impossible to eliminate it from the preserve. Control would be a continuous process, and the following areas would be treated:

> areas where important resource values were threatened, particularly essential habitat for protected species and significant cultural resource sites

areas where infestations conflicted with visitor use, particularly along major road corridors where scenic quality was being adversely affected

A target area of 2,000 to 3,000 acres within the preserve would be treated annually, roughly doubling the current program. Methods for controlling each of these species are still being developed, and systematic experimentation with treatment techniques would be incorporated into the control program. The National Park Service would continue to cooperate with the interagency Exotic Pest Plant Control Council in developing treatment methods. In the short term, treatments would continue to involve an integrated program of cutting, herbicide applications, and prescribed fire. As at present, herbicides would be used conservatively to protect nontarget plants, wildlife, water quality, and visitors and employees. Herbicide use must conform to NPS integrated pest management policies and regulations of the Environmental Protection Agency, Occupational Safety and Health Administration, and other federal and state agencies. To date practical biological controls have not been found for any of the exotic plants. If such controls were developed in the future, and it was clear that the treatment posed no threat to other nontarget resources, then biological controls would be used to reduce herbicide applications in the preserve.

The control of exotic plants along state and county roads in the preserve would be coordinated with the appropriate agency.

Volunteer labor for exotic plant control would be encouraged. The NPS preserve staff would continue to coordinate volunteer efforts into the preservewide program. Coordination would also provide for the health and safety of volunteers.

Fire Management

Wildland fire management includes all fire-related activity, including suppression and all use of prescribed fire. Guidance for the preserve's fire program has been provided by the fire management plan, which requires updating. Recommendations for changes in the plan are as follows:

Prescribed Fire. The National Park Service recognizes the use of fire as an advantageous means to achieve natural resource management goals. The preserve uses two types of prescribed fire to attain some of these goals – planned ignitions and prescribed natural fire.

Planned ignitions are those fires set either by NPS employees or by private citizens operating under the auspices of NPS managers. These ignitions are made under certain fire prescription parameters, with specific, quantifiable objectives. Similarly, prescribed natural fires must also meet prescriptions to achieve predetermined fire and resource management objectives for the area involved. Monitoring of fire behavior, fire spread, and strict compliance with safeguards is mandatory to ensure that natural fires meet stated objectives.

The preserve would use prescribed fire to attain the following objectives (not necessarily in priority order):

Reduce hazard fuel accumulations in the backcountry, around improvements, and along all major roadside corridors.

Maintain pasturage on cattle grazing leases.

Manage wildlife habitat for game, nongame, protected, and rare species.

Research the ecological role of fire in the preserve's varied ecosystem.

Control exotic plant species.

Protect cultural and natural resources that are fire-intolerant.

Meet operational needs such as vista clearing and debris removal.

Each of these objectives is discussed briefly below.

Reduction of hazardous fuels would be accomplished through planned ignitions and prescribed natural fires. Planned ignitions would be concentrated in areas traditionally subject to arson fires, especially along US 41 and Turner River Road (Collier County 839). Prescribed burning throughout the preserve would also be used to provide a margin of safety around government facilities, exempt inholdings, and oil and gas developments. Large tracts of interior pinelands and prairies would be burned to break fuel continuity in order to limit the possibility of large wildfires from developing and moving across the preserve.

NPS managers would continue to cooperate with landowners desiring permits to burn their lands for fuel reduction.

The National Park Service would still cooperate with cattle lessees to improve pasturage through prescribed burning in the Bear Island unit. Burning for pasturage is compatible with NPS habitat management objectives and would continue to be restricted to pinelands and marshes on a three-year cycle.

Wildland fire is a vital ingredient in the south Florida ecosystem, with many plants and animals dependent on it. Increased wildlife mobility as a result of understory removal, increased edge effect, nutrient recycling, and increased palatability are all associated benefits of periodic fire. In addition to benefiting threatened or endangered species such as the Cape Sable seaside sparrow and the red-cockaded woodpecker, prescribed fire would be used to maintain and improve habitat for deer, turkey, and other game and nongame species. Guidelines for prescribed burning for wildlife habitat management would be developed in cooperation with the Florida Game and Fresh Water Fish Commission.

Research would continue to be conducted on the ecological impacts and effects of fire. Studies of burns would continue so that data could be collected about the effects of season, frequency, and intensity on vegetation and wildlife. Cooperative research projects with private agencies, Everglades National Park, and the South Florida Research Center concerning all facets of fire ecology would continue. The fire history of the preserve would continue to be documented.

Studies are underway in south Florida as to the feasibility of controlling exotic plant species with prescribed fire. Should these studies prove favorable, prescribed burning would be further integrated into the existing exotic plant control program.

The preserve contains numerous archeological sites and endemic plant sites that are subject to damage or destruction by fire during the dry season. These resources may be protected by application of low-intensity prescribed fire to remove excessive fuel loads that become hazardous during the dry season.

Small-scale prescribed burns for vista clearing, debris removal, and other operational needs would continue. Strict adherence to fire prescriptions would be maintained to avoid inadvertent resource damage, particularly involving fires within hammocks or other fire-sensitive vegetation types.

To achieve these prescribed fire goals, the acreage burned annually would be increased to as much as 50,000 acres, double the current program. The increase would depend on stated objectives, along with available budget and staffing. For the most part prescribed burning would occur in prairie, cypress prairie, marsh, and pineland types.

Wildfire Suppression. Fire suppression includes all actions taken to extinguish or limit the size of a fire. Fires not classified as prescribed fires are classified as wildfires and would receive prompt, safe, cost-effective suppression action. Wildfires would continue to be suppressed to meet the following fire management objectives (in priority order):

Protect human life.

Protect public and private property.

Preserve state and federally listed species and their habitats.

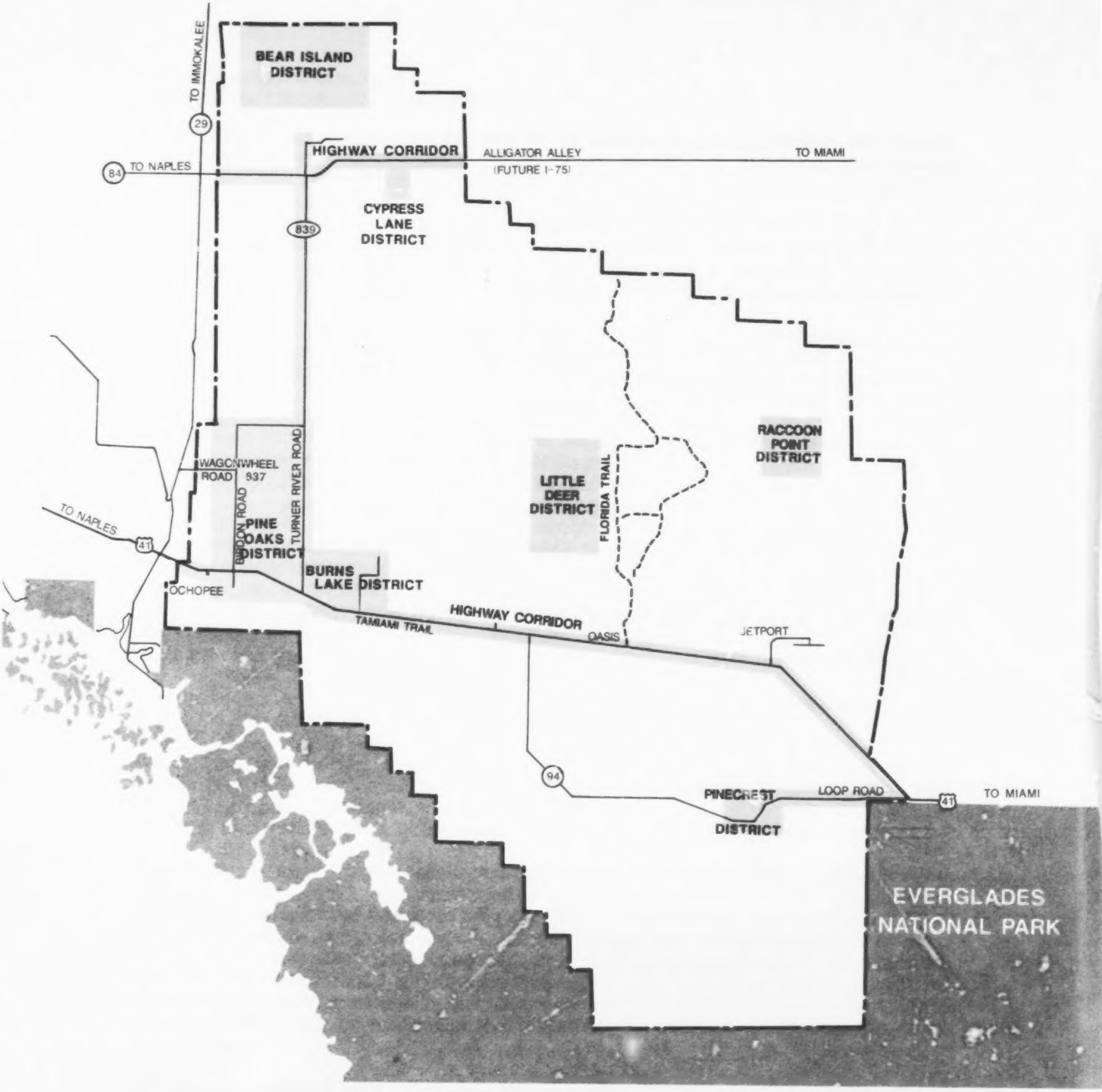
Protect selected cultural resources.

Protect lands adjoining the preserve.

Terminate management fires that exceed prescription limits.

In all declared wildfire situations, the highest priorities would be to protect human life and public and private property. To help achieve these objectives, eight wildfire suppression districts that encompass concentrations of residences, camps, government facilities, and oil and gas developments would be designated (see Fire Suppression Districts map). Wildfires in these districts, or fires threatening to enter them, would have a high priority for suppression. Prescribed burning for hazard fuel reduction would also be emphasized in these districts.

The National Park Service would continue to rely on the Ochopee Fire Control District for frontcountry structural fire suppression in the preserve.


TO IMMOKALEE
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ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
839
CYPRESS LANE DISTRICT
RACCOON POINT DISTRICT
LITTLE DEER DISTRICT
FLORIDA TRAIL
WAGONWHEEL ROAD
837
BIRDON ROAD
TURNER RIVER ROAD
PINE OAKS DISTRICT
TO NAPLES
41
BURNS LAKE DISTRICT
OCHOPEE
TAMIAMI TRAIL
HIGHWAY CORRIDOR
OASIS
JETPORT
94
PINECREST DISTRICT
LOOP ROAD
41
TO MIAMI
EVERGLADES NATIONAL PARK

FIRE SUPPRESSION DISTRICTS

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

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Fires could be prescribed to maintain or encourage certain habitats for rare, threatened, or endangered species, but any wildfires that threatened such habitats would be actively suppressed. Significant cultural resource sites that could be adversely affected by fire denudation or peat fires would also be protected from fires. Care would be taken during suppression operations to avoid disrupting cultural sites (see "Cultural Resource Management").

The National Park Service would suppress wildfires within the preserve that could escape to adjoining lands. Prescribed burns or prescribed natural fires would be allowed to go beyond the preserve's boundary only if such actions were in accordance with existing memorandums of understanding with the affected landowners.

Any prescribed fire or prescribed natural fire that exceeded prescription parameters because of weather changes or other causes would be actively suppressed.

Wildlife

Wildlife management actions would be directed at protected species and game species. A total of 37 animal species in Big Cypress would continue to receive some level of special protection because of their recognition as endangered, threatened, or rare species by the federal government, the state of Florida, or the Convention on International Trade in Endangered Species (see tables 22 and 23 in the "Affected Environment" section). Of the listed species, only four – the Florida panther, Cape Sable seaside sparrow, red-cockaded woodpecker, and *Liguus* tree snails – require special management actions, as outlined below. The other species would generally benefit from the continuation of actions to maintain natural water regimes, use prescribed burning and suppress wildfires, control exotic species, and protect from unlawful collection.

Game management actions contained in the general management plan would be directed at white-tailed deer and feral hogs. The National Park Service would continue to cooperate with the Florida Game and Fresh Water Fish Commission in the management of all game species.

Florida Panther. The *Florida Panther Revised Recovery Plan* (USFWS 1987a) has the following goals:

> Identify, protect, and enhance existing Florida panther populations rangewide, as well as protect and manage habitats.
>
> Establish positive public support for the management of the Florida panther.
>
> Reintroduce Florida panthers into areas of suitable habitat.

In line with these goals, this general management plan proposes six actions for protecting the panther within Big Cypress National Preserve. Four actions are associated with the first goal of the recovery plan: (1) maintain panther habitat, (2) reduce human activity in panther habitat, (3) reduce hunting pressure on prey species, and (4) continue research on panthers and prey. The final two actions are (5) to develop interpretive programs to establish positive public support for panther management, and (6) to cooperate with the Florida Game and Fresh Water Fish Commission and U.S. Fish and Wildlife Service to reintroduce Florida panthers into areas of suitable habitat in the preserve. These actions would be carried out in conjunction with the participation schedules established through the Florida Panther Interagency Committee. Each of these actions is further discussed below.

Maintenance of panther habitat – Habitat management would largely be accomplished by increasing the prescribed burning program to restore the natural role of fire and to encourage prey species, particularly in known panther areas. The objectives would be to increase quantity, nutritive value, palatability, and accessibility of deer and hog food plants while retaining adequate cover. Prescribed burning for habitat would be concentrated in pinelands, marshes, cypress prairies, and prairies. Some experimental use of fire in cypress domes and strands could be conducted to determine effects, value, and techniques of burning for habitat. Hardwood hammocks would be protected from fire to maintain mast production and protective cover. Prescribed burning for habitat would be integrated into the preservewide fire management plan, which would involve as much as 50,000 acres annually (see "Fire Management" section).

Reduction of human activity in Florida panther habitat – Actions to reduce human activity in panther habitat areas would include restrictions on ORV use and oil and gas development activities, plus cooperation with other agencies to reduce panther road kills. Efforts would be concentrated in known panther areas; however, further controls would be implemented if future information indicated their need. As described in the "ORV Use" section, ORVs would be restricted to designated trails in the Bear Island and Corn Dance units, and they would be prohibited in the Deep Lake unit to better control use in known panther areas.

As described in the "Minerals" section, oil and gas surface occupancy in the Bear Island unit, which is a known panther area, would be restricted to previously disturbed pad and road sites, and future developments in other units would be strictly controlled.

The National Park Service would continue to cooperate with the Florida Game and Fresh Water Fish Commission and the Department of Transportation to control traffic speeds through the preserve. Currently the major roads in the preserve are outside the jurisdiction of the National Park Service. The National Park Service supports the Florida Department of Transportation's proposed wildlife crossing structures and bridge extensions for panthers planned for when Florida 84 is converted to I-75. The National Park Service further supports an interchange on I-75 at Florida 29, provided that similar wildlife crossing structures and bridge extensions would be constructed on Florida 29 and that all quadrants at the interchange were publicly owned. ORV access off I-75 within the current boundaries of the preserve is not supported because of the potential disturbance to an area known to support panthers (see "ORV Use").

Reduction of hunting pressure on prey – Actions to reduce hunting pressure on deer and hogs, the principal prey species, are detailed in the "Hunting" section. In summary hunting would be regulated by means of the following actions:

establishing full-season quotas on the numbers of hunters permitted in each unit

limiting the total number of days open to all types of hunting to 140 days per year

eliminating the use of dogs for deer and hog hunting in known panther areas in the Bear Island, Deep Lake, and Corn Dance units and prohibiting dogs in the Stairsteps unit where deer – and panthers, should they be present – are more restricted to isolated hammocks in freshwater marshes

Continued research on panthers and prey – The National Park Service would support additional research pertinent to the management of the Florida panther and would continue to cooperate with the Florida Game and Fresh Water Fish Commission and the U.S. Fish and Wildlife Service for research in Big Cypress (the study is more fully described in the "White-tailed Deer and Feral Hogs" section).

Establishment of positive public support – To better inform the public about the condition and importance of the Florida panther, the proposed interpretive program at the Oasis visitor center would include literature and other media about panthers. References to the panther would also be made at some of the proposed interpretive boardwalks, and outreach programs by NPS staff would be continued for sportsmen, other recreational users, and conservation groups. In addition the National Park Service would cooperate with other federal and state agencies to produce an audiovisual program describing the panther's plight and management actions needed to save it.

Possible reintroduction of panthers bred in captivity – The Florida Game and Fresh Water Fish Commission is currently involved with a breeding program for captive Florida panthers. If requested, the National Park Service would cooperate with the commission and the U.S. Fish and Wildlife Service to reintroduce panthers into the wild at Big Cypress. Before releasing a captive-bred panther within the preserve, the agencies would have to concur on the release site, which would be selected after a thorough review of established panther home ranges, human activity in the area, and the probable ability of the habitat to support new panthers.

White-tailed Deer and Feral Hogs. Under the proposed action the intent of management programs for white-tailed deer and feral hog populations would be (1) to provide for game population levels that would maintain ecological processes (such as, predator/prey relationships and productivity of browse plants), and (2) to improve the prey base for the endangered Florida panther. Of the 13 game species in Big Cypress, white-tailed deer and feral hogs require special management consideration because of their importance to the endangered Florida panther and recreational hunters.

Management programs – Management programs would be directed by the provisions of the general management plan but would remain flexible to respond to fluctuations in water levels, changing hunting pressures, disease threats, and other unpredictable factors that affect wildlife populations. Therefore, programs would continue to be reviewed at least annually by the National Park Service, the Florida Game and Fresh Water Fish Commission, and the U.S. Fish and Wildlife Service. Guidelines for habitat management and research are described below.

Although an exotic species, feral hogs would be controlled rather than eliminated so long as they are thought to be an important prey species for the Florida panther. The primary tool for hog management would be recreational hunting (see "Hunting"). Hunting and trapping by NPS and FGFWFC personnel may also be used for research or where recreational hunting must be supplemented to control the hog population. To the extent feasible, hog populations would be locally controlled to reduce adverse impacts of rooting on native plants and animals and archeological resources. Regulations controlling hog hunting harvests for the Loop and Stairsteps units would be designed to provide a buffer for Everglades National Park to prevent expansion of hog populations there.

Prescribed burning would be used to maintain or improve deer habitat to support natural abundance in the preserve. Deer would be the primary beneficiaries of habitat management programs, but hogs would also benefit. The objectives of burning would be to increase quantity, nutritive value, palatability, and accessibility of deer food plants, and to retain adequate cover. Prescribed burning for habitat would be concentrated in pinelands, freshwater marshes, and prairies. Some experimental use of fire in cypress domes and strands might be conducted to determine effects, value, and techniques of burning for habitat. Hardwood hammocks would be protected from fire to maintain mast production and protective cover. Burning for habitat would be integrated into the preservewide fire management plan (see "Fire Management" section).

Exotic plants that threatened deer and hog habitat would be actively controlled. The greatest threat is from melaleuca, and efforts to suppress this plant would be expanded (see "Exotic Species").

Monitoring of deer and hog harvests would continue to be conducted to determine the need for any changes in hunting management. Mandatory checks of harvested game would be improved (see "Hunting"). Harvest information would be augmented by other census techniques, which could include aerial and spotlight surveys, hunter interviews, track and pellet counts, and browse and rooting surveys. Health and condition information would continue to be collected from harvested bucks and hogs at check stations, and the National Park Service would work with the Florida Game and Fresh Water Fish Commission to continue to collect similar data on does. A more systematic monitoring program would be developed in cooperation with the game commission.

Comprehensive ecological study – As advised by the Florida Panther Technical Advisory Council (1985) and the Deer Management Review Panel (1986), a comprehensive ecological study of deer, feral hogs, and Florida panther would be conducted. Investigations would focus on Big Cypress and would also be coordinated with the ongoing research efforts of the Florida Game and Fresh Water Fish Commission into panther and deer ecology. The study would be designed to determine how habitat should best be managed for panther, deer, and hogs (as prey for panthers), and how management of hunting and other human activities could be improved to avoid conflicts with panther and deer protection goals. The long-term goal of the comprehensive study would be to determine interrelationships among panther, prey species, and hunting, and to guide future management actions.

The objective of the comprehensive study would be to better determine the status of white-tailed deer and feral hogs in the preserve. For both species basic population statistics would continue to be collected. Data would include distribution and density, sex and age ratios, natality, recruitment, health and condition, and mortality (deaths from hunting compared to panther predation and other causes). Energetics of deer and hog populations would be investigated, including seasonal and daily movements, movements related to human activities, habitat utilization, and food preferences and nutrition. From this information methods of periodically estimating carrying capacities of management units or habitat types would be developed.

Baseline data on panthers would continue to be collected. Data would refine estimates of the population and health status of panthers, document panther reproduction and recruitment, and document habitat utilization and panther movements.

The comprehensive study would also investigate other panther prey species (such as armadillos and other small game) to determine their importance to panther survival. In particular, investigations would determine if panther predation on certain other species reflected a poor condition of the prey base as a whole and whether management changes to benefit other prey species were needed. If warranted, population and energetics studies of selected species would be conducted, similar to those for deer and hogs.

Cape Sable Seaside Sparrow. To better protect the Cape Sable seaside sparrow, a cyclic monitoring program would be initiated for the southern portion of the preserve. Monitoring would be designed to economically assess the status of the sparrow and to guide fire management in sparrow habitat.

Prescribed burning would continue to be used for habitat maintenance. Burning schedules would be established in the updated fire management plan. Prescribed fires would follow the guidelines contained in the *Cape Sable Seaside Sparrow Recovery Plan* (USFWS 1982):

> Burning would be conducted in the wet season (between August and November) and would be controlled to produce a mosaic of burned and unburned patches of 500 acres or less.
>
> No more than 10 to 20 percent of the total area of the preserve providing habitat would be burned in a single year.
>
> Fire rotations would vary from five to 10 years, depending on vegetation type and density.

> Fires would be suppressed in Cape Sable seaside sparrow habitat if they occurred in the dry season (February to mid-July), if large fires were likely to result in a uniform (rather than patchy) burn, or if fires occurred sooner than appropriate for the vegetation involved.

In keeping with the recovery plan, research would be conducted to determine the causes of the decline in the subpopulation in the Ochopee area. The study would develop and assess potential management actions to reestablish habitat for the sparrows. If practicable methods for reestablishment were found, actions would be implemented in consultation with the U.S. Fish and Wildlife Service, the Florida Game and Fresh Water Fish Commission, and other interested agencies.

Geophysical activities to locate oil and gas reserves in Cape Sable seaside sparrow habitat would be scheduled to avoid critical nesting periods and sites. Additional stipulations would be applied as necessary to plans of operations on a project-by-project basis.

Exotic plants, primarily melaleuca and Australian pine, have threatened Cape Sable sparrow habitat in the eastern Everglades east of the preserve. Although Cape Sable sparrow habitat in the preserve is not immediately threatened by an invasion of exotic plants, if exotic trees or shrubs became established in sparrow areas, the plants would have a high priority for removal.

Red-Cockaded Woodpecker. Proposed management would be similar to the current management program. Known red-cockaded woodpecker colonies would continue to be monitored in cooperation with the Florida Game and Fresh Water Fish Commission to assess the health of the Big Cypress populations. Monitoring would also provide information for burning requirements to maintain colonies. As manpower and funding allowed, other areas of the preserve would be inspected for colonies.

Known colonies and potential red-cockaded woodpecker habitat would be burned on a three- to five-year rotation schedule to control hardwood invasion and retain pine reproduction. Burn plans would be developed in consultation with the Florida Game and Fresh Water Fish Commission and the Florida Department of Forestry. Prescribed burning for the woodpecker would be integrated with the overall fire management program for the preserve to make the most efficient use of fire management personnel and equipment. In addition to maintaining red-cockaded woodpecker habitat, such burns would also be expected to reduce hazardous fuel loads and improve browse for deer and other wildlife.

To avoid noise disturbance to red-cockaded woodpeckers and to provide an undisturbed forage area, new construction of oil and gas roads, pads, or pipelines would be prohibited adjacent to known colonies or mature pine stands that could support colonies. Exploration activity would also be prohibited within 500 feet of known colonies and would be permitted through potential habitat only after the area had been surveyed and certified not to contain any colonies. No activities that would compromise potential habitat, such as cutting or damage to mature pines, would be permitted.

***Liguus* Tree Snails.** The National Park Service would continue to cooperate with the Florida Game and Fresh Water Fish Commission to regulate the collecting of tree snails.

NPS regulation of snail collecting would correspond to the state regulation protecting species of special concern, which reads

> No person shall take, possess, transport, or sell any species of special concern or parts thereof or nests or eggs except as authorized by commission regulation or by permit . . . , permits being issued upon reasonable conclusion that the permitted activity will not be detrimental to the survival potential of the species (Florida Administrative Code 39-27.02)

If future research projects have concluded that collecting can be conducted without detriment to tree snail populations, then collecting would be allowed in the preserve to the extent that tree snail populations and other natural and cultural resources were not adversely affected. Regulations would be updated to protect snail populations and genetic diversity, and would include

an annual fee for a collecting permit

submittal by collectors of an annual data sheet quantifying collection activities

a daily bag limit on the possession of tree snail shells within the preserve

prohibition of transferal and release of tree snail color forms between hammocks

As discussed under "Fire Management," tree snail habitat on hardwood hammocks would be protected from catastrophic fires. If predation by exotic animals was determined to be a serious threat to tree snail populations, then trapping or direct reduction of exotics could be used to locally control predation.

Exotic Species. Ideally, the goal of exotic animal management would be the elimination of all nonnative species within the preserve; however, this goal would be extremely difficult to achieve because of the magnitude of the problem. Management actions and the extent of control over exotics must be weighed against the costs and benefits to native biological communities and visitor safety and enjoyment of the preserve, as well as manpower and budget considerations. Management programs would focus on feral hogs, armadillos, and fire ants. The National Park Service would not attempt to control lovebugs or other exotic species that are not a major threat to native communities or visitor safety.

So long as feral hogs are considered to be an important prey for Florida panthers, they would be controlled (1) to maintain an adequate prey base in known panther areas, (2) to buffer Everglades National Park from emigration of hogs from Big Cypress, and (3) to protect where feasible natural and cultural sites from rooting damage. The primary technique for hog control would be recreational hunting. At selected sites fencing, trapping, or direct reduction programs could be implemented. (See preceding "Deer and Hog" section for further discussion.)

Armadillos would be controlled at significant archeological sites. Site-specific controls would include fencing, trapping, or direct reduction (see "Cultural Resource Management").

An integrated program for fire ant control would be carried out around developed areas. Controls would include habitat management (for example, landscaping with native materials to provide shade), mechanical removal of mounds, and limited pesticide use. Any pesticide use would conform to NPS integrated pest management policies, and EPA, OSHA, and other state and federal regulations. Similar actions would be taken for rodents and other pests affecting developed areas.

Exotic fish have invaded roadside canals and many abandoned quarries and rock pits in the preserve. There are approximately 30 major and 43 minor such excavations in Big Cypress, accounting for a total of 250 acres. The pits have vertical walls and are commonly 20 to 30 feet deep. The vertical walls prevent the establishment of native aquatic communities associated with shallow wetland conditions, giving exotic species a survival advantage. To the extent practicable, such abandoned excavations would be filled or the walls would be sloped to provide a littoral environment to encourage native aquatic plants and animals over exotic species.

CULTURAL RESOURCE MANAGEMENT

Management of Historical and Archeological Resources

The National Park Service's Southeast Archeological Center (SEAC) conducted an archeological inventory and evaluation of sites within Big Cypress National Preserve over a five-year period from 1977 to 1981. Although extensive, the survey probably did not locate all sites within the preserve. Under the proposed action the archeological center would work with the state historic preservation officer to determine the level of further fieldwork that might be necessary. The center would also work with the state historic preservation officer to determine the potential significance of all sites known within Big Cypress.

Based on that determination of site significance, two management strategies for cultural resources would be proposed – passive management of resource sites that do not meet the criteria of eligibility for inclusion on the National Register of Historic Places, and active protection of sites on or eligible for the National Register.

Passive Management. Under passive management programs, sites would be allowed to deteriorate, leading to their eventual reclamation by nature. Human activities that directly contributed to the deterioration of sites, however, would be discouraged. Because the significance of these resources is based only on a preliminary evaluation, the Southeast Archeological Center would be notified so a more thorough search could be made before any site development or oil and gas exploration activities were allowed.

Active Management. An active protection program would be undertaken for all sites on or eligible for inclusion on the National Register of Historic Places. No oil and gas development (roads, pads, etc.) would be allowed to affect these sites. Removal of exotic vegetation would be actively pursued. Methods to control burrowing or rooting animals would be actively implemented to avoid the destruction of cultural resources. Data recovery through professional archeological excavation would be conducted as a last resort where resource threats were determined to be beyond the control of NPS managers (for example, if resource destruction by burrowing armadillos or hog rooting was not controllable).

Two native American ceremonial sites within Big Cypress are considered to be of national significance and would be nominated to the National Register – Corn Dance site 216 and Corn Dance Island 116. The National Park Service, in accordance with the American Indian Religious Freedom Act of 1978, is working with the various Miccosukee and Seminole groups to protect the privacy and sanctity of their ceremonial and burial sites. Looting of these sites is a problem, and the Park Service would patrol such sites and vigorously prosecute all looters.

The following specific actions would be proposed for sites on or eligible for the National Register:

> The Southeast Archeological Center, in consultation with the state historic preservation officer, would develop and provide to the preserve staff a list of sites on or eligible for listing on the National Register. These sites would be the most sensitive to vandalism, so it would be important for the staff to know their locations. Methods to prevent and deter vandalism would be implemented, which could include on-site inspections and patrols.
>
> Law enforcement personnel would be trained in cultural resource management law (including chapter 872, Florida Statutes 1987, pertaining to human remains) and would develop a systematic program to protect known archeological and historic sites from vandalism. Action would be taken to prosecute violators under the Archeological Resources Protection Act of 1979 and, when applicable, provisions of chapter 872 of the Florida Statutes.
>
> Signs would be posted at visitor contact areas to inform the public about laws and associated penalties for vandalizing archeological sites on federal lands. Other media would also be used to further educate the public about the significance and fragility of cultural resources.
>
> Methods of effectively controlling armadillo burrowing and hog rooting at significant cultural resource sites within the preserve would be investigated and implemented. Such methods would include increased hunting, trapping, and fencing. Where such methods proved to be ineffective, then data recovery excavation proposals would be developed, funded, and initiated for affected sites.
>
> The preserve staff and the Southeast Archeological Center would prepare a list of archeological sites near occupied improved properties. Routine inspections of the sites would include a visual inspection for obvious excavation activities, and any violations would be addressed under existing law.
>
> During the removal and cleanup of unimproved camps, the preserve staff would use the least destructive methods to avoid damage to archeological remains.
>
> The program to remove exotic plants (for example, Brazilian pepper and Australian pine) would be expanded to include cultural resource sites.

Fire management specialists would be informed of cultural resource site locations so that prescribed burns and wildfire suppression activities would not adversely affect such sites. An assessment of fire damage would be conducted to determine any impacts after each burn.

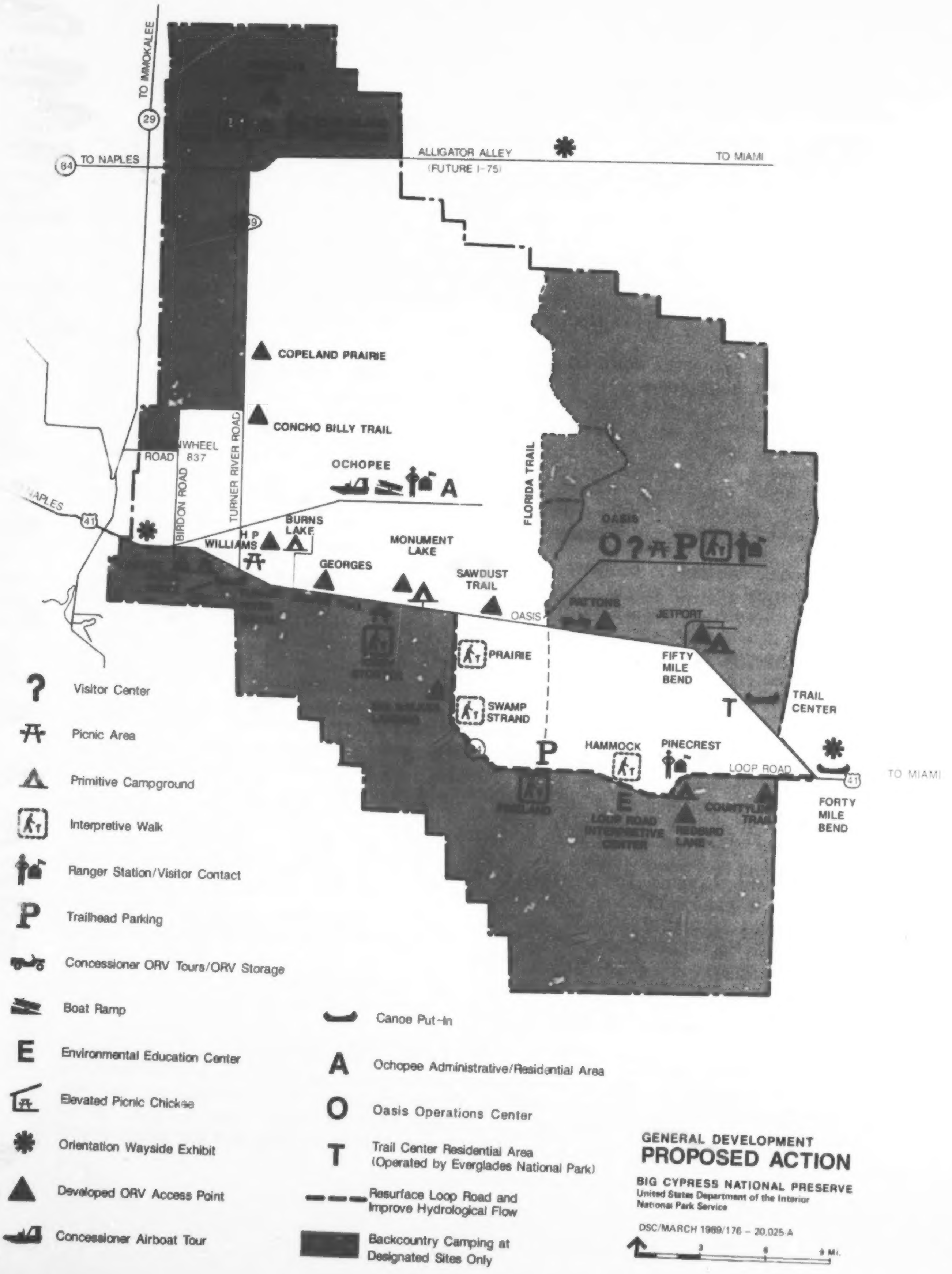
A cultural resource management plan would be developed to address future preservation and management of cultural resources within the preserve. Proposals for site-specific treatment would be developed as part of the plan. The draft plan would be prepared by the Southeast Archeological Center, in consultation with the state historic preservation officer.

Management of Native American Use and Occupancy

PL 93-440, which established Big Cypress National Preserve, provides that members of the Miccosukee and Seminole tribes of Florida will be allowed to continue their usual and customary use and occupancy of federal lands and waters within the preserve, including hunting, fishing, and trapping on a subsistence basis and traditional tribal ceremonials. It also provides for maximum Indian participation in any authorized future revenue-producing visitor service within the preserve. To protect the rights of Indians and the resource values of the preserve, the act directs the secretary of the interior to establish reasonable regulations. With the assistance of Miccosukee and Seminole groups and other interested parties, the extent and impacts of these subsistence and cultural activities would be determined, and reasonable regulations would be promulgated separate from this general management plan. Ethnographic and other resources studies would be conducted as necessary for developing such regulations. In addition the American Indian Religious Freedom Act of 1978 protects native American rights to pursue traditional religious activities and the use of sacred resources on federal lands. The National Park Service would continue to cooperate with native American groups to protect ceremonial sites and ensure their freedom of access.

GENERAL DEVELOPMENT

Developments supporting visitor services and preserve management would continue to be concentrated along US 41, the primary visitor access route into the preserve. Secondary facilities for visitor use and resource protection would be provided along the Loop Road and in the Bear Island unit. Two major developed areas – the preserve's headquarters and housing area at Ochopee and the Oasis operations and visitor services center – are discussed in detail below. The remaining proposed facilities are listed functionally under the headings orientation waysides, trails, camping facilities, picnic areas, road and access improvements, concessioner development, and outlying ranger stations. The locations of proposed facilities are shown on the General Development map.


TO IMMOKALEE
29
84
TO NAPLES
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
839
COPELAND PRAIRIE
CONCHO BILLY TRAIL
WHEEL
ROAD
837
BIRDON ROAD
TURNER RIVER ROAD
OCHOPEE
A
NAPLES
41
FLORIDA TRAIL
BURNS LAKE
H P WILLIAMS
MONUMENT LAKE
GEORGES
SAWDUST TRAIL
OASIS
O ? P
PATTONS
JETPORT
OASIS
PRAIRIE
SWAMP STRAND
FIFTY MILE BEND
T
TRAIL CENTER
94
P
HAMMOCK
PINECREST
LOOP ROAD
41
TO MIAMI
FORTY MILE BEND
E
LOOP ROAD INTERPRETIVE CENTER
REDBIRD LAKE
COUNTYLINE TRAIL
? Visitor Center
Picnic Area
Primitive Campground
Interpretive Walk
Ranger Station/Visitor Contact
P Trailhead Parking
Concessioner ORV Tours/ORV Storage
Boat Ramp
E Environmental Education Center
Elevated Picnic Chickee
Orientation Wayside Exhibit
Developed ORV Access Point
Concessioner Airboat Tour
Canoe Put-In
A Ochopee Administrative/Residential Area
O Oasis Operations Center
T Trail Center Residential Area (Operated by Everglades National Park)
Resurface Loop Road and Improve Hydrological Flow
Backcountry Camping at Designated Sites Only
0 3 6 9 Mi.

GENERAL DEVELOPMENT
PROPOSED ACTION

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,025-A

The intent of development is to provide structures for quality visitor recreation and interpretation and for NPS operations while limiting any further modification of natural and cultural resources. To achieve this objective, most development would take place at existing disturbed sites. NPS housing would be consolidated at Oasis, Ochopee, and Pinecrest, and all other outlying NPS residences would be removed and their sites restored (see discussion on housing below). Some new disturbance would occur at proposed ORV staging areas, backcountry campsites, interpretive trails, and canoe put-ins. However, the extent of disturbance would be limited and is considered by the National Park Service to be necessary and appropriate to provide for public use and appreciation of the preserve's resources.

Proposed developments would be designed to provide access for handicapped persons. All proposed frontcountry developments – including visitor contact facilities, interpretive boardwalks, NPS picnic areas, and concessioner developments – would be accessible to visitors in wheelchairs, and selected interpretive displays would include media for handicapped visitors. Wheelchair accessibility to employee offices, work spaces, and residences would be improved. At Oasis and Ochopee the first floors of new and rehabilitated structures would be wheelchair accessible, and two apartments in the proposed multifamily housing area at Ochopee would be specifically designed for handicapped persons.

The recommendation to continue to provide employee housing within the preserve is in conformance with Office of Management and Budget Circular A-18. About 23 NPS employees would be required to reside within the preserve so they could quickly respond to wildfires and other emergencies, as well as ensure visitor safety and protect private and public property. Additional housing for nonessential personnel is currently provided and would be continued under the proposed action because of a lack of adequate housing at a reasonable cost within commuting distance of the preserve. All government housing would continue to be rented to employees at prevailing area rates. Because the surrounding region is primarily rural, private sector housing is extremely limited. Outside the preserve most lodging is rented on a daily, weekly, or monthly basis by visitors or private sector workers at rates far exceeding the economic means of NPS employees. Consequently, the lack of available housing has become a deterrent to seasonal applicants, making it increasingly difficult to attract the best qualified persons. Proposed employee housing would help keep and attract highly qualified NPS employees and allow for needed staffing increases to support expanded visitor services and resource management programs. The objective for constructing or retaining government residences would be to provide housing for all essential personnel (23); all other nonlocal seasonal employees (17); and at least 30 percent of nonlocal, nonessential permanent employees (about 15). Housing facilities and locations are discussed below. Estimated development costs and phasing are included in appendix D.

Ochopee Development Concept Plan

Ochopee would continue to serve as the administrative headquarters of the preserve because it is close to other government offices and services in Naples and because the recently acquired Big Cypress Lodge is readily adaptable as a headquarters building. Ochopee would also be used as the principal NPS residential area because of the opportunity to adapt a portion of the lodge for multifamily housing and the availability of the existing Everglades Shores housing development – which includes filled land, circulatory roads, and utilities. Secondary activities at Ochopee would include visitor information/orientation contact and building and utilities maintenance.

The proposed actions at Ochopee include adaptive use of the Big Cypress Lodge, rehabilitation and new construction of houses in the Everglades Shores subdivision, construction of a new maintenance area, and upgrading of the existing water and sewage systems. These proposals are discussed below, along with associated facilities affecting the site and mitigation necessary to deal with potential flooding at Ochopee. The layout of the proposed development is shown on the Ochopee Development Concept Plan map.

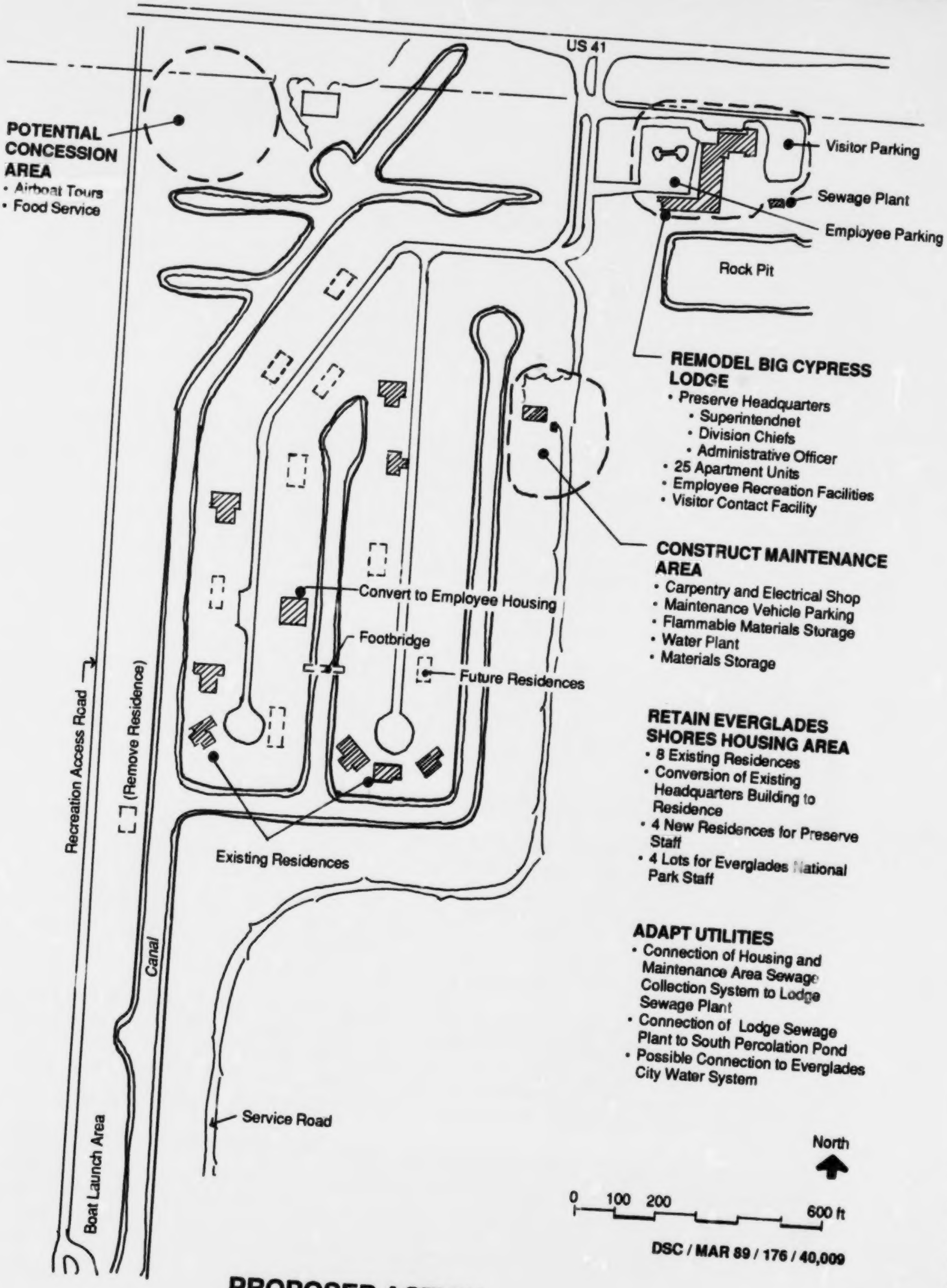
Big Cypress Lodge. The existing headquarters building at Ochopee was originally a single-family residence. The structure is too small for the 13 staff members currently stationed there, the rooms within the structure are poorly arranged for administrative offices, and the building is not easily accessible to the public nor does it contain space for visitor contact. Furthermore, new office space would be required to support proposed expansion of the visitor use and resource management programs. Under the proposed action the preserve's headquarters would be relocated to the Big Cypress Lodge. The lodge would better accommodate the headquarters expansion and would provide visibility and ready access for the public off US 41.

The A wing and a portion of the B wing (see the Ochopee Development Concept Plan map) of the lodge would be adapted for visitor contact, staff offices, and laboratory research. The visitor contact portion would be a relatively small reception area designed for information and orientation only (the primary interpretive center for visitors would be at Oasis). Offices would be provided for the superintendent, division chiefs, administrative personnel, and other support staff. New laboratory facilities at the headquarters would provide needed wet lab capabilities for resource-related research.

A detailed estimate of spatial needs is shown in table 2. Approximately 6,300 square feet would be adapted for the headquarters facilities. The A wing would contain about 4,100 square feet, with the remaining 2,200 square feet in the B wing. (Square footages are estimates only; actual square footage would be dictated by the existing structure and adjusted accordingly.) The rest of the B wing and all of the C wing (a total of about 13,000 square feet) would be adapted as multifamily housing for NPS preserve staff. Rehabilitation of the motel units would house about 25 employees.

Multifamily housing would primarily serve seasonal and other temporary employees. About six fire crew positions would require occupancy during the fire season. If available, remaining space in the lodge could be leased to other state and federal agencies involved in resource management in Big Cypress. The existing swimming pool and terrace would be maintained for employee physical fitness and recreation.

Parking at the lodge would accommodate about 30 visitor vehicles and 50 staff and resident vehicles.


US 41
Visitor Parking
Sewage Plant
Employee Parking
Rock Pit
Convert to Employee Housing
Footbridge
Future Residences
Existing Residences
Recreation Access Road
(Remove Residence)
Canal
Service Road
Boat Launch Area
North
0
100
200
600 ft

POTENTIAL CONCESSION AREA
- Airboat Tours
- Food Service

REMODEL BIG CYPRESS LODGE
- Preserve Headquarters
  - Superintendnet
  - Division Chiefs
  - Administrative Officer
- 25 Apartment Units
- Employee Recreation Facilities
- Visitor Contact Facility

CONSTRUCT MAINTENANCE AREA
- Carpentry and Electrical Shop
- Maintenance Vehicle Parking
- Flammable Materials Storage
- Water Plant
- Materials Storage

RETAIN EVERGLADES SHORES HOUSING AREA
- 8 Existing Residences
- Conversion of Existing Headquarters Building to Residence
- 4 New Residences for Preserve Staff
- 4 Lots for Everglades National Park Staff

ADAPT UTILITIES
- Connection of Housing and Maintenance Area Sewage Collection System to Lodge Sewage Plant
- Connection of Lodge Sewage Plant to South Percolation Pond
- Possible Connection to Everglades City Water System

DSC / MAR 89 / 176 / 40,009

PROPOSED ACTION
Ochopee Development Concept Plan
Big Cypress National Preserve / Florida

Table 2: Structural Space Estimates, Ochopee Development Concept Plan Proposed Action

Personnel or Function		Grade	Square Feet
Big Cypress Lodge (Headquarters)			
Office Space			
1	Resource management specialist	GS-12	120
1	Environmental specialist	GS-11	120
1	Park ranger	GS-9	80
*1	Researcher (seasonal)	GS-5	**
*1	Secretary (resource management)	GS-5	80
1	Chief ranger	GS-11	120
*2	Park rangers	GS-7	120
*2	Park rangers (seasonal)	GS-5	**
*1	Secretary	GS-5	80
*1	Interpretive specialist	GS-9	120
*1	Interpreter	GS-7	**
*2	Interpreters (seasonal)	GS-5	**
1	Park manager	GS-13	300
1	Secretary	GS-5	80
1	Research biologist	GS-11	120
1	Administrative officer	GS-9	120
1	Purchasing clerk	GS-5	80
1	Clerk typist	GS-4	80
*1	Personnel clerk	GS-5	80
*1	Property clerk	GS-5	80
*1	Files/clerk typist	GS-5	80
*1	Computer specialist	GS-9	80
*1	Research assistant	GS-7	80
*1	Concessions specialist	GS-9	80
*1	Management specialist	GS-11	120
1	Facility manager	GS-12	120
1	Maintenance mechanic foreman	WS-8	80
*1	Secretary (maintenance)	GS-5	80
*1	Engineering/draftsman	GS-7	120
*1	Administrative technician	GS-5	80
Other Functions			
	Visitor contact area (includes office and storage)		600
	Public restrooms		200
	Employee restrooms		200
	Computer room		200
	Wet and dry laboratories		400
	Employee lounge/lunch room		300
	Conference room		200
	Files		200
	Subtotal		5,000
	Total: Headquarters Offices (includes 25% for corridors and mechanical space)		6,250

Personnel or Function		Grade	Square Feet
Big Cypress Lodge (cont.)			
Remainder of B and C wings converted to multifamily housing (about 25 new units)			13,000
Big Cypress Lodge Total Space			19,250
Proposed Maintenance Shop			
Office Space			
1	Utility systems operator	WG-9	**
1	Electrician	WG-10	**
1	Maintenance worker	WG-7	**
2	Maintenance workers (seasonal)	WG-5	**
*1	Maintenance worker	WG-7	**
*2	Maintenance workers (seasonal)	WG-5	**
*1	Janitor/grounds keeper	WG-2	**
1	Carpenter	WG-2	**
2	Laborers (seasonal)	WG-3	**
Other Functions			
	Electrical shop		200
	Carpentry shop		400
	General work area		200
	Supplies and materials storage		200
	Accountable property storage		200
	Lumber storage		200
	Locker room/restrooms/showers		500
	Total		1,900
Other Functions			
Proposed equipment/vehicle storage shed			2,000
Proposed flammable materials storage building			200
Existing water plant			900
Everglades Shores Housing Area			
8	Existing single-family residences		1,100 to 1,900 each
1	Converted headquarters building		2,800
4	New single-family residences		1,100 to 1,900 each

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*Proposed position.

**Position uses a common space or is primarily in the field.

Everglades Shores Housing Area. The Everglades Shores subdivision, which was privately developed before establishment of the preserve, would continue to serve as the primary NPS housing area for Big Cypress. Eight existing NPS-owned residences would be retained, and the current headquarters building would be converted back to a residence. Four new houses (2 to 3 bedrooms, 1,100 to 1,900 square feet each) would be constructed within the subdivision for a total of 13 single-family residences. Three positions would have required occupancy at the housing area – district ranger, utilities operator, and fire management officer. These employees are necessary for visitor safety, law enforcement, property protection, and wildfire emergencies. Up to four additional lots in the subdivision would be available for future residential construction to serve Everglades National Park staff stationed at nearby Everglades City.

Maintenance Area. New maintenance facilities would be constructed adjacent to the existing water treatment plant at Ochopee. The maintenance station would serve the western portion of the preserve. Because it is adjacent to the primary NPS housing area and is close to suppliers in Naples, the station would also be the center for carpentry, electrical work, and other projects related to building and utility maintenance. Accordingly, the proposed maintenance station would contain the existing water plant (900 square feet) and a new equipment storage shed (2,000 square feet), a maintenance shop (1,900 square feet), and flammable materials storage building (200 square feet). Table 2 shows a breakdown for office spaces and other functions. The compound would be fenced for security (about 2,000 feet of chain link fencing).

Utilities. The Ochopee developed area has water, sewer, and electrical systems originally constructed for a large subdivision and motel complex. Consequently, proposed NPS facilities are well within the capacities of the existing distribution systems, and this system would continue to be used for the foreseeable future.

There is, however, a regional problem with the known carcinogen Trihalomethane (THM) in drinking water in south Florida. The state maximum contaminant level for THM is 100 parts per billion (ppb). While the Ochopee level is currently within this standard (about 60 ppb), THM levels have previously run as high as 225 ppb. Removal of THM at the Ochopee water plant would require advanced equipment and highly trained personnel, and it would probably not be cost-effective for such a small system. Everglades City also has a THM problem (contaminant levels are at 150 ppb), and eventual treatment for THM may become available at their larger water system. If the THM problem reoccurs at Ochopee, the economic viability of treating water on site or connecting to the Everglades City water system would be reassessed. Connecting the existing Ochopee water distribution system to the Everglades City waterlines would require an estimated 15,000 feet of 4-inch pipe and construction of a 60,000-gallon storage tank at Ochopee.

The Big Cypress Lodge complex includes an extended aeration plant and percolation pond for sewage treatment (capacity of 15,000 gallons per day). The system is in good working order, and sludge containment in the plant is above the projected 100-year flood level. The system serves only the lodge, and current and projected use from the lodge is well below the sewage system capacity. Residences at adjoining Everglades Shores have individual septic tanks that function within state standards but do not provide as thorough wastewater treatment as the lodge's aeration plant. The individual septic tanks are also expensive to maintain. Besides individual septic tanks, the houses and unoccupied lots in the subdivision are also connected by an unused gravity collection system that has been in place since the development was constructed.

To further improve wastewater treatment at Ochopee, the Everglades Shores housing area and the proposed maintenance station would be connected to the lodge's aeration plant by rehabilitating the existing collection system and providing a new link to the lodge (500 feet of 8-inch pipe, 500 feet of 4-inch force main, and a pumping station). A larger unused percolation pond just south of Everglades Shores would be reactivated and connected to the lodge treatment plant (2,500 feet of 2-inch force main and a pumping station). The pond east of the lodge and adjacent to US 41 would be reclaimed.

The existing three-phase electrical power provided by Lee County Electric Cooperative Corporation is adequate for the proposed development.

Associated Facilities. As proposed additional housing is constructed at Ochopee, all of the remote NPS-owned housing in the western portion of the preserve would be removed. Three houses at Bass Lake Estates, three houses on Turner River Road, one house on Birdon Road, and two houses and a former wellhouse on US 41 would be removed and the sites reclaimed with native vegetation.

As described under "Concessioner Development" below, a concessioner store and airboat tours operation may be developed off US 41 near Ochopee, possibly utilizing Halfway Creek canal for airboat access. Seagrape Drive would also be upgraded to improve public boat launching facilities. Vegetation plantings would screen the Everglades Shores housing area to protect privacy and control noise.

Flood Hazard Mitigation. The Ochopee area, including preserve headquarters and the proposed Dona Drive campground, is within the 100-year floodplain, and the developed area could be flooded to a depth of 8 feet above mean sea level, which is approximately 4 feet above ground level at Ochopee (see the description of water flows in the "Affected Environment"). The flooding would be caused by hurricane storm surge and, therefore, is predictable, with a two- or three-day warning. To mitigate the potential effects of flooding, the National Park Service would continue to maintain an emergency evacuation plan to protect lives and limit property damage. Further, the design of new structures or the rehabilitation of existing structures would incorporate methods for minimizing storm damage as contained in the National Flood Insurance Program's "Floodplain Management Criteria for Flood-Prone Areas" (44 CFR 60.3). Accordingly, most new structures would be elevated above the projected 100-year flood level. In keeping with NPS policy, an alternative for removing all structures from the floodplain has been developed (see alternative B) but is not considered practicable because of the high costs of removing and replacing existing structures and because much of the flood hazard at Ochopee can be mitigated by proper design. The rationale for retaining developments within the 100-year floodplain will be further documented in a statement of findings that will accompany the final environmental impact statement and general management plan.

Oasis Development Concept Plan

Because of its central location, Oasis would continue to be the visitor services and operations center for the preserve. Maintenance facilities at Oasis would serve the eastern portion of the preserve and would be the maintenance hub for work on vehicles, major equipment, and roads and trails. Proposed developments are described below and are shown on the Oasis Development Concept Plan map.

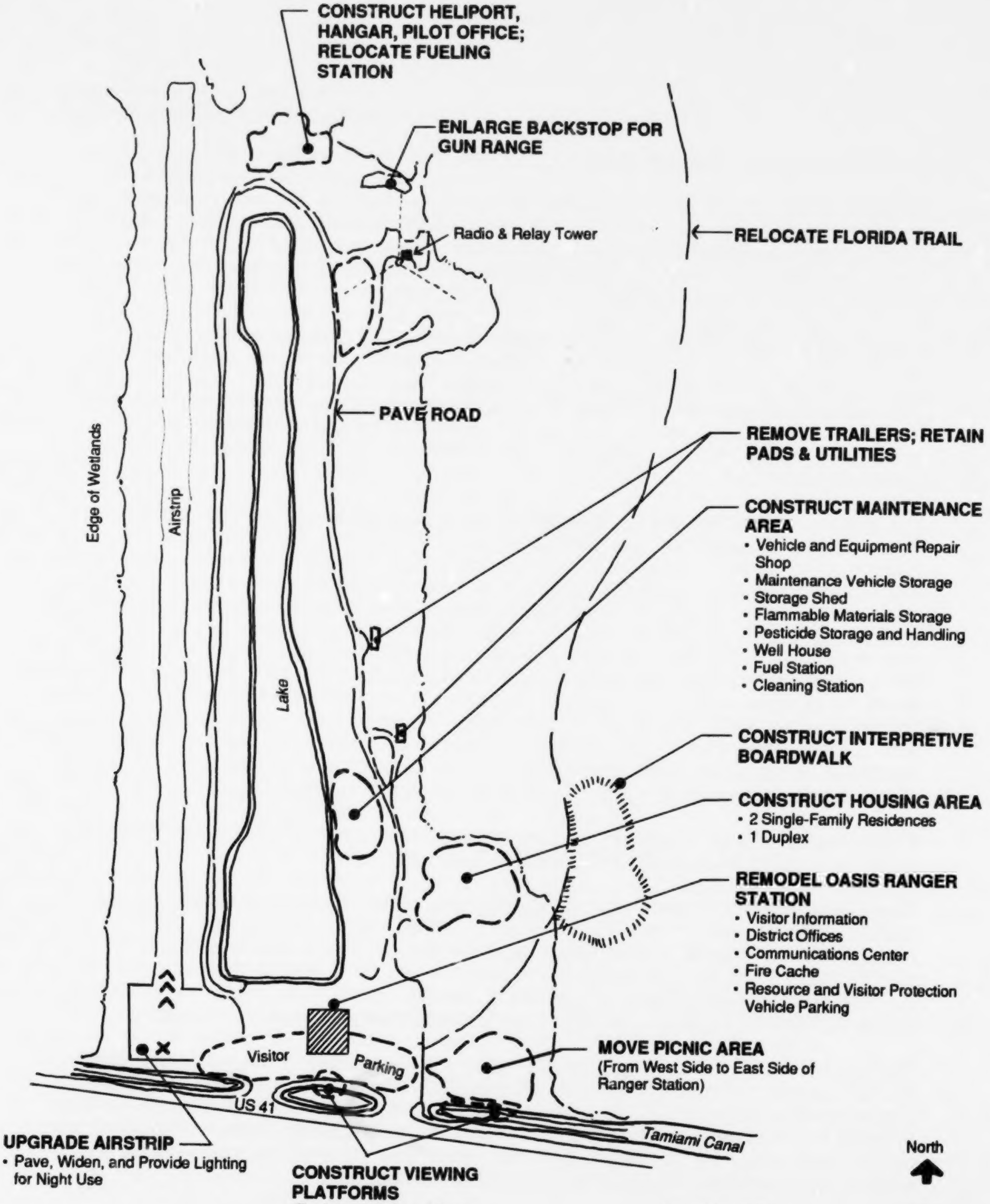
Visitor Center and Picnic Area. As described in the "Visitor Use" section, about 2,100 square feet on the ground floor of the existing Oasis visitor center have been remodeled for interpretive exhibit space and an information desk (about 1,340 square feet), an audiovisual room (400 square feet), an interpretive office (250 square feet), and public restrooms (130 square feet). This space would be the primary visitor contact and interpretive center for the preserve, with exhibits and other media as previously described.

The parking area at the Oasis visitor center would be redesigned to better accommodate visitor access. A pedestrian walk would lead from the visitor center entrance to the canal in front of the center. The existing metal guardrail encircling the canal would be removed and replaced with more aesthetic materials. A hard-surfaced walkway would connect the visitor center to the proposed picnic area, where six picnic tables with shade structures would be provided. A 75-foot boardwalk would be developed next to and on the north side of the canal near the picnic area to allow for wildlife viewing. A 150-foot portion of the metal guardrail along the north side of US 41 across from the proposed boardwalk would be replaced with more aesthetic materials. The canal beside the picnic area and across from the visitor center would be actively managed for a variety of native plants and animals to enhance the visitor experience. In addition, a 0.5-mile interpretive boardwalk would be provided adjacent to and on the east side of the picnic area. The boardwalk would also serve as the terminus of the Florida National Scenic Trail.

Parking for a total of about 50 vehicles would be provided for the visitor center, the picnic area, interpretive boardwalks, and the Florida trail.

Operations Center. Besides accommodating the visitor center, the south half of the existing building would continue to house offices and work space for resource management and ranger personnel, as well as a library, conference room, and communications center. The allocation of space would be similar to that shown in table 3. The current arrangement of personnel in the south half would be revised to accommodate new positions, but no major structural changes would be necessary.

The north half of the building consists of two large spaces originally constructed as aircraft hangars and currently used as a mechanical and vehicle repair shop, plus vehicle and equipment storage. Existing storage space is limited, and use of the space for both storage and maintenance is inefficient. Under the proposal the eastern portion (2,300 square feet) would be converted to a fire cache and fire management work space to support the expanded prescribed burning and fire control program.


CONSTRUCT HELIPORT, HANGAR, PILOT OFFICE; RELOCATE FUELING STATION
ENLARGE BACKSTOP FOR GUN RANGE
Radio & Relay Tower
RELOCATE FLORIDA TRAIL
PAVE ROAD
Edge of Wetlands
Airstrip
Lake
REMOVE TRAILERS; RETAIN PADS & UTILITIES
CONSTRUCT MAINTENANCE AREA
• Vehicle and Equipment Repair Shop
• Maintenance Vehicle Storage
• Storage Shed
• Flammable Materials Storage
• Pesticide Storage and Handling
• Well House
• Fuel Station
• Cleaning Station
CONSTRUCT INTERPRETIVE BOARDWALK
CONSTRUCT HOUSING AREA
• 2 Single-Family Residences
• 1 Duplex
REMODEL OASIS RANGER STATION
• Visitor Information
• District Offices
• Communications Center
• Fire Cache
• Resource and Visitor Protection Vehicle Parking
Visitor
Parking
MOVE PICNIC AREA
(From West Side to East Side of Ranger Station)
US 41
Tamiami Canal
UPGRADE AIRSTRIP
• Pave, Widen, and Provide Lighting for Night Use
CONSTRUCT VIEWING PLATFORMS
(For Interpretation of Canal)
North
0
100
200
600 ft

DSC / MAR 89 / 176 / 40,014

PROPOSED ACTION
Oasis Development Concept Plan
Big Cypress National Preserve / Florida

Table 3: Structural Space Estimates, Oasis Development Concept Plan Proposed Action

Personnel or Function	Grade	Square Feet
Existing Building - South Half		
Office Space		
1 Park ranger (resource management)	GS-7	80
*1 Hydrologist	GS-9	80
*1 Assistant hydrologist (seasonal)	GS-5	**
*1 Botanist (exotic species control)	GS-9	80
*6 Assistant botanists (seasonal)	GS-5	**
*1 Wildlife biologist	GS-9	80
2 District rangers	GS-9	200
2 Park rangers	GS-7	80
2 Park rangers (seasonal)	GS-5	80
2 Dispatchers	GS-5	80
1 Fire management officer	GS-11	150
*4 Park rangers	GS-7	160
*4 Park rangers (seasonal)	GS-5	**
*1 Law enforcement specialist	GS-9	80
*2 Interpreters	GS-7	260
*4 Interpreters (seasonal)	GS-5	**
Other Functions		
Conference room		500
Library		300
Visitor center		
Audiovisual room		400
Exhibits/information/orientation		1,340
Restrooms		130
Restrooms and showers		3,000
Dry laboratory		120
Subtotal		4,500
Total (includes 25% for corridors and mechanical space)		5,625
Existing Building – North Half		
Office Space		
*1 Assistant fire management officer	GS-11	120
*1 Prescribed fire specialist	GS-11	80
*1 Fire Dispatcher	GS-7	80
*1 Fire cache manager	GS-9	**
14 Fire crew (seasonal)	GS-5	**
Other Functions		
Fire cache and fire management work space		2,100
Secured operational and emergency vehicle and equipment storage		3,600
Total		5,980
Oasis Building Total Space		11,605

Personnel or Function	Grade	Square Feet
Proposed Helicopter Hangar		
Office Space		
1 Aircraft pilot	GS-12	120
Other Functions		
Equipment storage		200
Hangar		1,600
Total		1,920
Proposed Maintenance Shop		
Other Space		
*1 Maintenance mechanic foreman	WS-8	200
*1 Engineering equipment operator	WG-10	**
1 Heavy mobile equipment mechanic	WG-10	**
1 Maintenance worker (temporary)	WG-5	**
*2 Motor vehicle operators	WG-8	**
*1 Automotive helper	WG-5	**
*1 Janitor	WG-2	**
*2 Laborers – general (seasonal)	WG-3	**
*1 Maintenance leader – roads and trails	WG-6	**
*3 Maintenance workers – roads and trails	WG-5	**
*1 Maintenance worker (Loop Road)	WG-5	**
Other Functions		
Vehicle repair shop (secured)		1,200
Supplies and material storage		600
Accountable equipment storage		600
Sign shop		400
Locker room/showers/restroom		500
Total		3,500
Other Functions		
Proposed covered vehicle storage shed		3,000
Proposed covered material storage shed		1,000
Proposed flammable material storage building		200
Proposed pesticide storage and handling building		400
Proposed vehicle and equipment cleaning building		200
Existing well house		100
Proposed housing		
1 Duplex		2,000
2 Single-family residences		1,800 each

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* Proposed position.
**Position uses a common space or is primarily in the field.

Interior partitions would be constructed for a 200-square-foot office for fire management personnel. The cache and work space would house equipment, a pumper truck, and off-road vehicles used in fire management.

The western portion of the north wing (about 3,600 square feet) would house emergency vehicles, as well as vehicles and equipment used in daily operations. Property to be stored there would include chain saws, hand tools, first-aid equipment, swamp buggies and airboats, street-legal vehicles, and other items susceptible to theft or vandalism and in need of secured, covered storage.

Airstrip. The existing dirt airstrip would be paved and lighted so that operations are not limited to daylight hours and dry weather. A helicopter hangar with equipment storage and an office for the pilot (about 2,000 square feet total) would be constructed near the northern end of the runway. The aircraft fueling station would be moved adjacent to the hangar.

Maintenance Area. A new maintenance compound would be constructed north of the operations center and east of the rock pit. Maintenance shops and storage structures would be expanded to service designated ORV trails, improved campgrounds, ORV access points, backcountry chickees, interpretive waysides, and other proposed facilities. The compound would contain a 3,500-square-foot shop building for major equipment and vehicle repair, roads and trails maintenance, and district maintenance support. A 3,000-square-foot storage shed would be constructed for maintenance vehicles, and a 1,000-square-foot shed would be constructed for materials storage. Four small separate structures would be provided for flammable materials storage (200 square feet), pesticide storage and handling (400 square feet), a well house (100 square feet), and a vehicle equipment cleaning station (200 square feet). The vehicle repair shop, pesticide building, and cleaning station would include liquid waste treatment equipment to avoid contamination of surface water and groundwater. Once the new maintenance compound has been completed, the existing woodshop, 0.75 mile east of Oasis, would be removed.

Housing. Two single-family residences (three bedrooms; about 1,900 square feet per house) and a duplex (two bedrooms per unit; a total of 2,000 square feet) would be constructed east of the proposed maintenance area. The single-family residences would be for staff who provide year-round protection of government property at Oasis and who respond to visitor safety and law enforcement emergencies in the eastern portion of the preserve. During the fire season the duplex would be occupied by about eight fire crew members.

Two trailers at Oasis would be removed; however, three existing trailer pads with utility hookups would be retained to rent to seasonal employees who have their own mobile homes.

Utilities. Approximately 2,000 feet of water, electrical, and telephone lines would be extended to the proposed hangar, and a septic system would be installed. Septic systems would also be provided for the proposed single-family residences, duplex, and new maintenance shop. These facilities would be tied into existing electrical and water lines.

Orientation Waysides

Three orientation waysides would be developed – at the east and west entrances to the preserve on US 41 and at mile-marker 38 on Florida 84. Parking at the waysides on US 41 would accommodate five to seven cars each. The wayside on Florida 84 would be associated with an existing rest area or a proposed rest area on I-75.

Trails

Interpretive Trails. Interpretive trails would be developed at three main areas within the preserve – along the Loop Road, in the Bear Island unit, and at Kirby Storter Roadside Park.

Each of the four interpretive pulloffs along the Loop Road would require a limited amount of fill (approximately 0.3 acre and 3,000 cubic feet each) to support a hard-surfaced, five- to seven-car parking area. At each interpretive stop a trailhead and approximately 0.5-mile interpretive trail would be constructed. Portions of most interpretive trails would include a boardwalk.

For the Bear Island interpretive trail a small parking area for five to seven cars would be developed at the end of Turner River Road. This parking area would be on existing fill and would serve as the trailhead for a 1-mile boardwalk to the East Hinson Marsh overlook.

At Kirby Storter Roadside Park the existing boardwalk would be extended by 500 feet to provide a loop into the cypress prairie as part of the interpretive experience.

Canoe Trails. Canoe trail staging areas would be developed at Forty Mile Bend and either the Turner River canal or Turner River, depending on future water conditions after the Turner River restoration project has been completed.

For the Turner River site a small eight- to 10-car/trailer staging area (approximately 0.5 to 0.75 acre) would be constructed on the south side of US 41. Trash receptacles would be provided. A deceleration lane would be provided for visitors entering the staging area from the west, and reduced speed zones would be established for traffic from both directions. A shaded picnic chickee (200 sq ft) would be constructed downstream from the staging area and would be designed to accommodate two separate boating parties. Self-contained toilet units would be provided at the staging area and the chickee.

At Forty Mile Bend a small eight- to 10-car/trailer staging area would be developed on the north side of US 41; no fill would be required. Visitors would be able to shuttle between this staging area and a second one that would be built on the north side of US 41 across from Trail Center (see General Development map). The Trail Center staging area would also accommodate eight to 10 cars and would require approximately 0.3 to 0.5 acre of fill. Trash receptacles would be provided at both staging areas. The canal portion of the canoe trail on the north side of US 41 would be cleared to allow passage by canoes. Cooperative agreements with the Florida Department of Transportation and the South Florida Water Management District would be required to implement this canoe trail and staging area proposal.

Hiking Trail – Florida National Scenic Trail. Those portions of the existing Florida trail that overlap with established ORV trails would be relocated and marked. A 1-mile portion of the trail would be relocated from the west side of the Oasis visitor center to the east side. The backstop for the NPS pistol range would be enlarged to ensure hiker safety. Trail work would be done in cooperation with the Florida Trail Association.

Camping Facilities

Frontcountry Campgrounds. Four of the five locations now used as camping areas (existing filled sites), plus the proposed Red Bird Lane campground along the Loop Road and the Dona Drive campground on US 41, would be developed as primitive campgrounds. The numbers of designated sites for each campground are listed in table 4. The campgrounds would be contoured, with additional material to resurface existing fill areas. Exotic vegetation would be removed, and native vegetation used for landscaping and shade. Campground entrance roads and loop roads with porous surfaces would be designed and constructed to provide year-round access. Approximately 1 acre of wetlands would be filled to upgrade these six campgrounds. A water well would be dug for each campground, and a small structure to house the water well pump and chlorination station would be built. Each campground would have two comfort stations and a sewage disposal station for recreation vehicles. Directional signs for the campgrounds would be posted along highways, and at each camping area signs would be posted for circulation. Informal camping at the Midway fill-pad would be discontinued and the site reclaimed.

Table 4: Facilities at Proposed Primitive Campgrounds

Campground	No. of Sites*	No. of Comfort Stations**	Potable Water***
Bear Island	30-45	2	yes
Burns Lake	40-50	2	yes
Monument Lake	40-50	2	yes
Dona Drive	40-50	2	yes
Fifty Mile Bend	40-50	2	yes
Red Bird Lane	30-45	2	yes

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* Each site includes parking space, picnic table, and grill.

** Each comfort station includes two toilets; comfort stations and recreational vehicle sewage disposal stations would have vault holding tanks for sewage pump-out; sewage would be trucked out of the preserve for treatment.

*** Four wells, chlorination station, and distribution lines would be constructed, with two centrally located faucets for public use.

Backcountry Shelters. Approximately 50 shelters would be constructed for backcountry camping by hunters, ORV users, and other recreationists. These screened structures would be approximately 400 square feet and would accommodate four to six people plus equipment. The shelters would be located and designed to blend with the surrounding terrain. Water would be provided only if a shelter was in an area with an existing well.

Road and Access Improvements

Loop Road. A total of 20.5 miles of the Loop Road would be upgraded to provide visitors with a reliable alternative driving and interpretive experience. Potholes would be filled, collapsed culverts replaced, new drainage structures provided in critical locations to improve water flow, and the road surface improved. No additional wetlands would be filled.

ORV Access and Staging Areas. Staging areas for ORV access would be developed at 13 sites throughout the preserve. In the Bear Island unit at Perocchi Grade, a parking area for 10 cars with trailers would be provided. This area would be designed and located so that it could be expanded for up to 30 cars/trailers, if warranted by demand. Up to 0.75 acre of fill would be needed. The other 12 developed staging areas would provide parking for five to 10 cars with trailers. Approximately 0.5 acre of fill would be needed to develop each of the following sites: County Line Trail, Sig Walker Landing, Sawdust Trail, Monument Lake, Georges, Burns Lake, Concho Billy Trail, and Airplane Prairie (see General Development map). Trash receptacles would be provided at all developed ORV staging areas. Surface areas would consist of pervious materials to reduce direct runoff into adjacent wetlands.

Concessioner Development

A possible location for the primary concessioner operation would be at Pattons (see General Development map). Facilities would be developed for canoe and swamp buggy rentals, outfitter services, ORV storage, buggy and airboat maintenance services, convenience store, gas, and restrooms. A satellite facility near Ochopee would provide for airboat tours, outfitter services, restrooms, and a convenience store. Visitor parking and a secure airboat storage area for the concessioner would be constructed nearby. The Halfway Creek canal would be used for the concessioner airboat access.

Before developing a concessions prospectus, the National Park Service would prepare an economic feasibility study to determine whether these concessions would be viable. NPS policy requires, to the extent it is economically feasible, the concessioner to undertake all costs relating to construction of its own facilities, as well as utilities, roads, parking, and similar infrastructure. Such a feasibility determination has not yet been made, but it would be accomplished before the final plan was implemented. A preliminary study (NPS, Pishnery 1986a) indicated some assistance with site preparation or other amenities might be necessary. The estimated cost allocations for NPS involvement in such development are shown in appendix D and must be regarded as tentative. In keeping with PL 93-440, any new revenue-producing visitor services would initially be offered to the Miccosukee and Seminole tribes for their right of first refusal.

Outlying Ranger Stations

In addition to the administrative center at Ochopee and the operations center at Oasis, two outlying ranger stations would also be provided for visitor services, safety, and resource protection. A permanent ranger station/residence would be established near Pinecrest at a property on Tamarind Hammock recently acquired by the National Park Service. The site includes two residences plus other structures associated with a former commercial campground. The larger residence would be adapted as a ranger station/residence; the other would serve as a quarters for a seasonal ranger. Personnel (probably one permanent and one seasonal ranger) would be stationed there to patrol the Loop Road, the Loop Road interpretive center, the proposed campground at Red Bird Lane, and the Loop and Stairsteps units. In addition to the residences, an adjacent structure at the Tamarind Hammock site would be adapted for maintenance supplies and equipment storage for servicing the proposed campground at Red Bird Lane.

A pad, electric generator, waterline, and septic system would be constructed near the Bear Island campground for a mobile home or other temporary structure to house a ranger station and residence. Personnel (probably one permanent and one seasonal ranger) would be stationed here during the fall-to-spring hunting and visitor use seasons to patrol the Bear Island, upper Deep Lake, and Turner River units, plus the Bear Island campground.

Other Facilities

The Loop Road interpretive center would continue to be operated in the preserve by the National Park Service. Structures would be upgraded as necessary; new or rehabilitated facilities would remain within the existing grounds of the center, with no additional filling or clearing of Tamarind Hammock.

The Trail Center housing area would also remain within the preserve and would be operated by Everglades National Park. As with the Loop Road interpretive center, there would be no new filling or other modification of natural wetlands adjacent to Trail Center. Outlying residences used by Everglades National Park staff would be removed and the sites restored.

PROBABLE SCENARIO WITH IMPLEMENTATION OF THE PROPOSED ACTION

The broad directions outlined in the proposed action have been extrapolated as a scenario to indicate how the land base at Big Cypress could be affected and to identify characteristic activities and other resulting environmental effects. The scenario is not part of the proposed action, but rather an example of what could happen with implementation of the proposed action as it relates to future NPS actions and to future oil and gas activity.

NPS Development, ORV, and Resource Management Scenario

Table 5 lists the approximate acreages occupied, the types of cover vegetation potentially affected, and the area and volume of fill material that could be required for proposed facility developments. The areas and volumes given are rough estimates based on field reconnaissance and generic designs for parking areas, pulloffs, and other facilities. Area estimates are generous to avoid underestimating actual environmental effects. (Cover types potentially affected by development and other activities were derived from a 1:63,000 vegetation map prepared by the NPS Geographical Information Services Branch in Denver, Colorado.)

Table 6 shows estimates of mileages and areas to be occupied by ORV trails or to be recovered (based on U.S. Geological Survey color-infrared aerial photographs taken in March 1984). Because of dense forest cover in some locations, portions of trails through wooded areas tend to be underrepresented in the aerial photographs. Major trails through such areas were added by the preserve staff, partially offsetting the deficiency. However, the mileage estimates for existing trails are probably conservative. The mileages and area estimates are given only as an example of how the proposed action could be implemented and do not represent specific limits or commitments to maximums on future trail development.

Estimates of the area affected by hydrological management (table 7) were developed in consultation with hydrologists from the South Florida Research Center in Everglades National Park. The acreage estimate for the Turner River / Deep Lake Strand restoration project (NPS, Rosendahl and Sikkema 1981d) was based on water level measurements at Turner River and the Turner River canal, as well as a transect of nine wells drilled in the Turner River canal drainage. Estimates of acreages affected by improving drainage under the Loop Road and Paces Dike, the Bear Island Road, and various abandoned filled sites are gross estimates, based on opinions of NPS hydrologists. Future studies to better quantify effects are included in the proposed actions.

Estimates of acreage infested and treated for exotic plant control, plus fire management (table 7), were provided by the staff of Big Cypress National Preserve. Again, the acreage cited for future annual treatment is not a specific proposed limit on future actions, but an estimate of area that may be realistically affected under the proposed action.

Oil and Gas Development Scenario

Existing Development and Area of Influence. Existing oil and gas development sites were categorized as active or inactive. Inactive sites consist of past geophysical survey lines that continue to exhibit altered vegetation patterns, abandoned access roads and pads, and those sites in varying stages of reclamation. Inactive development sites include 474 miles of geophysical survey lines and 34 abandoned wells on 34 pads, which are scattered throughout the preserve. Active oil and gas development includes the Bear Island field (nine producing wells, eight shut-in wells, one saltwater injection well, and five plugged and abandoned wells, all on nine pads) and the Raccoon Point field (14 producing wells, one shut-in well, one incomplete well, and one saltwater disposal well on five pads). Direct surface disturbance, including former geophysical lines, related to existing oil and gas development is 1,117 acres.

Based on the area of influence criteria discussed in appendix B, a 0.5-mile radius area of influence was drawn around each existing oil and gas development (pad, access road, or pipeline). The area of influence was calculated manually by using a 40-acre overlay grid. The area of influence associated with past geophysical survey lines was limited to existing direct disturbance and was determined by correlating location, distance, and width of past survey lines with vegetation anomalies apparent on aerial photographs. The 0.5-mile radius area of influence was not applied to past geophysical lines because the long-term indirect effect associated with these lines is not as significant as the direct effects of access roads and well pads. The results of these calculations are given in table 8. The area of influence for existing oil and gas development totals approximately 38,458 acres, or 6.7 percent of the preserve.

Over 30 percent of the Bear Island unit is subject to the influence of oil and gas development, which is much higher than for any other unit. The area of influence for the Raccoon Point field and the Eleven Mile Road in the Corn Dance unit is approximately 11,988 acres, or 10.3 percent of the unit, with the Eleven Mile Road accounting for over half of the total. (See the Existing Areas of Influence for Oil and Gas Development map.)

Projected Development and Area of Influence. The oil and gas development scenario for the preserve assumes the existence of economical oil and gas reserves within Big Cypress, and a future demand that those reserves be developed over the next 15 years. It also assumes possible development in three areas – low-potential areas off the Sunniland trend, medium-potential areas on the trend but not on reef development areas, and high-potential areas of possible reef development also on the trend.

The scenario is based on a historical projection that uses existing well locations and the drilling pace of wells inside the preserve, as well as success ratios of wells drilled both inside and outside the preserve from 1967 to 1985 and economic fluctuations since 1967. The projections indicate that during the next 15 years, 21 exploratory (wildcat) and discovery wells could be drilled, one small field could be discovered off the trend, an average-size field (1,920 acres of drained oil and 12 wells, based on an analysis of existing fields all along the Sunniland trend) could be discovered on the trend, and a larger-than-average field could be discovered on the trend within areas of possible reef development. The projection also indicated that 31 wells could be drilled to develop the three fields plus six delineation wells, all contained on six megapads (see table 9).

This scenario also projects that 433 miles of geophysical survey lines would be run or proposed during the next 15 years – three large lines (139 miles each) and two small lines (8 miles each). Since large lines have historically covered much of the preserve, it is difficult to project where these lines might be placed (see the Existing Areas of Influence for Oil and Gas Development map). The smaller site delineation lines would most likely occur on the Sunniland trend. Table 9 shows the expected level of oil and gas development under the proposed action.

The anticipated 433 miles of additional geophysical survey lines would adversely influence approximately 277,120 acres, based on a 0.5-mile radius of influence and, for simplicity, assuming a single operation of this magnitude (rather than three large lines and two small ones). Although geophysical surveys would influence 640 acres per mile during actual operations, the long-term area of influence would only be the area of direct impact (524 acres), assuming operations were conducted in accordance with the stipulations of the minerals management plan.

Future construction of pads, roads, and pipelines could directly affect 203 acres (see table 9). An area of influence was defined around the projected field and predicted wildcat wells, based on an analysis of the fields' characteristics, the number of wells needed to develop the field, the number of megapads, and the number of field delineation wells. Using a 0.5-mile radius as the area of influence around each well or pad and along each road and pipeline, an additional 34,962 acres (6.1 percent of the preserve) would be influenced by these types of operations.

The total area of influence calculated for all types of projected oil and gas exploration and development is 35,486 acres, or 6.2 percent of the preserve. Adding this acreage to the area influenced by existing oil and gas development (38,458 acres) totals 73,944 acres, or 12.9 percent of the preserve. Since the projected development influence is over the 10 percent limit, new developments would have to be phased in order to remain below this limit.

Table 5: NPS Development Action Scenario, Proposed Action

General Development	Acreage Occupied by Existing NPS Development	Acreage Occupied by Proposed NPS Development	New Acreage Disturbed (+) or Restored (–)	Cover Type Affected	Acreage of Fill Deposited (+) or Removed (–)	Cubic Yards of Fill Deposited (+) or Removed (–)
Ochopee Headquarters Area						
Big Cypress Lodge renovation Maintenance shop Equipment/vehicle shed Flammable materials building Water plant Housing – 9 existing units and 4 new units Utilities – existing electricity, existing waterlines, new sewage lines (3,500 lin ft), rehabilitated percolation pond, and reclaimed percolation pond Parking	97	96	–1	Disturbed land (fill)	–1.0	–9,700
Associated action – remove 10 structures and 4 trailer pads	4	0	–4	Disturbed land (fill)	–1.0	–9,700
Oasis Visitor Center/Operations Center						
Picnic area Boardwalks (3) Oasis ranger station rehabilitation Landing strip Helicopter hangar Maintenance shop Vehicle storage Materials storage Flammable materials storage Pesticide storage Vehicle and equipment cleaning building Well house Housing (4 units) Florida trail relocation	44	44	0	Disturbed land (fill)	0	0
Associated action – remove 8 residences	3	0	–3	Disturbed land (fill)	–1.0	–4,800

General Development	Acreage Occupied by Existing NPS Development	Acreage Occupied by Proposed NPS Development	New Acreage Disturbed (+) or Restored (–)	Cover Type Affected	Acreage of Fill Deposited (+) or Removed (–)	Cubic Yards of Fill Deposited (+) or Removed (–)
0RV Access Points						
Dona Drive	0	0	0	Disturbed land (fill)	0	0
Burns Lake	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Georges	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Monument Lake	0	0.5	+0.5	Melaleuca and prairie	+0.5	+2,500
Sawdust Trail	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Pattons	0	0.5	0	Disturbed land (fill)	0	0
Fifty Mile Bend	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Airplane Prairie	0	0.5	+0.5	Prairie	+0.5	+2,500
Concho Billy Trail	0	0.5	+0.5	Prairie	+0.5	+2,500
Perocchi Grade	0	0.75	+0.75	Second-growth pineland	0	0
Sig Walker Landing	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Pinecrest	0	0.5	0	Disturbed land	0	0
County Line Trail	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Concessions – 0RV and Food Services						
Ochopee	0	0.5	0	Disturbed land (fill)	0	0
Pattons	0	19.0	0	Disturbed land (fill)	0	0
Orientation Wayside Exhibits						
West Entrance (near Carnestown)	0	0.3	+0.3	Marsh* and canal	+0.3	+3,000
East Entrance (Forty Mile Bend)	0	0.3	0	Disturbed land (fill)	0	0
Mile-marker 38	–	–	–	(No new development other than sign)	0	0
Canoe Put-Ins and Parking						
Turner River Canal	0	0.75	+0.75	Second-growth pinelands	0	0
Trail Center	0	0.3	+0.3	Cypress prairie	+0.3	+3,000
Forty Mile Bend	0	0.3	0	Disturbed land (fill)	0	0
Boat Ramp						
Seagrape Drive (rehabilitation) (Ochopee)	0.3	0.3	0	Disturbed land (fill)	0	0
Campground Rehabilitation						
Burns Lake	14.0	14.3	+0.3	Cypress prairie	+0.3	+3,000
Monument Lake	17.0	17.3	+0.3	Prairie	+0.3	+3,000
Dona Drive	11.0	11.0	0	Disturbed land (fill)	0	0
Fifty Mile Bend	11.0	11.3	+0.3	Cypress prairie	+0.3	+3,000
Red Bird Lane	0	2.5	+1.0	Disturbed land and hardwood hammock*	0	0
Bear Island	5.5	6.0	+0.5	Disturbed land and second-growth pinelands	0	0

General Development	Acreage Occupied by Existing NPS Development	Acreage Occupied by Proposed NPS Development	New Acreage Disturbed (+) or Restored (–)	Cover Type Affected	Acreage of Fill Deposited (+) or Removed (–)	Cubic Yards of Fill Deposited (+) or Removed (–)
Interpretive Trails						
Kirby Storter boardwalk extension	0	0.1	+0.1	Cypress strand/mixed-hardwood swamp*	0	0
East Hinson Marsh						
Parking	0	0.3	0	Disturbed land (fill)	0	0
Trail	0	0.75	+0.75	Cypress strand/mixed-hardwood swamp,* hardwood hammock,* marsh*	0	0
Loop Road – Prairie						
Parking	0	0.3	+0.3	Canal and prairie	+0.3	+3,000
Trail	0	0.5	+0.5	Prairie and cypress prairie	0	0
Loop Road – Cypress strand/ mixed-hardwood swamp						
Parking	0	0.3	+0.3	Canal and cypress strand/ mixed-hardwood swamp*	+0.3	+3,000
Trail	0	0.5	+0.5	Cypress strand/mixed-hardwood swamp*	0	0
Loop Road – Pinelands						
Parking	0	0.3	+0.3	Second-growth pines and cypress prairie	+0.3	+3,000
Trail	0	0.5	+0.5	Second-growth pines	0	0
Loop Road – Hardwood hammock						
Parking	0	0.3	0	Disturbed land	0	0
Trail	0	0.3	+0.3	Hardwood hammock* (previously disturbed)	0	0
Other Development						
Loop Road Trailhead Parking	0	0.3	+0.3	Cypress prairie	+0.3	+1,500
Pinecrest Ranger Station/ Maintenance Substation (rehabilitation)	0	3.0	0	Disturbed land	0	0
Bear Island Ranger Station	0	0.3	0	Disturbed land	0	0
Loop Road Interpretive Center	6.0	6.0	0	Disturbed land	0	0
Loop Road Improvements	55.0	55.0	0	Disturbed land (fill)	0	0
Trail Center Housing	16.0	16.0	0	Disturbed land (fill)	0	0
Totals	**283.8**	**315.65**	**+4.85** net new disturbance**		**+4.2**	**+23,800 cu yds**

---

*Important resource area.

**8.0 acres of restored land and 12.85 acres of new disturbance; 29.0 acres of land are already disturbed.

Table 6: ORV Management Scenario, Proposed Action

Management Unit	Existing Trail		Proposed Trail		Restored Trail	
	Miles	Acres	Miles	Acres	Miles	Acres
Bear Island	90	160	70	125	20	35
Deep Lake	120	215	0	0	120	215
Turner River	410	740	380	685	30	55
Corn Dance	120	215	100	180	20	35
Loop	0	0	0	0	0	0
Stairsteps	500	900	400	780	60	120
Total	**1,240**	**2,230**	**990**	**1,770**	**250**	**460**

Table 7: Resource Management Scenario, Proposed Action

Hydrological Management	Potential Acreage Affected
Turner River/Deep Lake Strand restoration: Install 19 plugs and 8 culverts in the Turner River and Birdon Road canals	3,000
Loop Road/Paces Dike mitigation: Install 5 bridges and numerous culverts along the Loop Road	28,000
Bear Island Road mitigation: Install culverts	7,000
Reclamation of disturbed sites: Remove fill material at selected locations along 30 miles of abandoned limerock roads	100
Total	**38,100**

Exotic Plant Control	Current Acreage Infested	Area Treated to Date	Average Area Treated Annually	Proposed Area Treated Annually
Melaleuca	38,400	3,578	1,000	2,500
Australian Pine	30	43	12	12
Brazilian Pepper	400	18	5	10

Fire Management	Current Average Annual Burned Acreage	Proposed Annual Prescribed Burn Acreage	Anticipated Annual Burned Wildfire Acreage
Prescribed Fire	9,000	50,000	–
Wildfire	20,000	–	15,000

Table 8: Occupied Acreage and Areas of Influence for Existing Oil and Gas Development

Management Unit (acres)	Occupied Acreage*	Area of Influence Acreage	Percentage of Management Unit Influenced	Percentage of Preserve Influenced
Bear Island (40,790)	183	12,956	31.8	2.2
Corn Dance (116,040)	222	12,174	10.5	2.1
Deep Lake (31,590)	58	1,649	5.2	0.3
Turner River (182,670)	531	8,596	4.7	1.5
Loop (56,870)	41	2,683	4.7	0.5
Stairsteps (146,480)	82	400	0.3	0.1
Total	**1,117**	**38,458**		**6.7**

Total preserve acreage = 574,440.

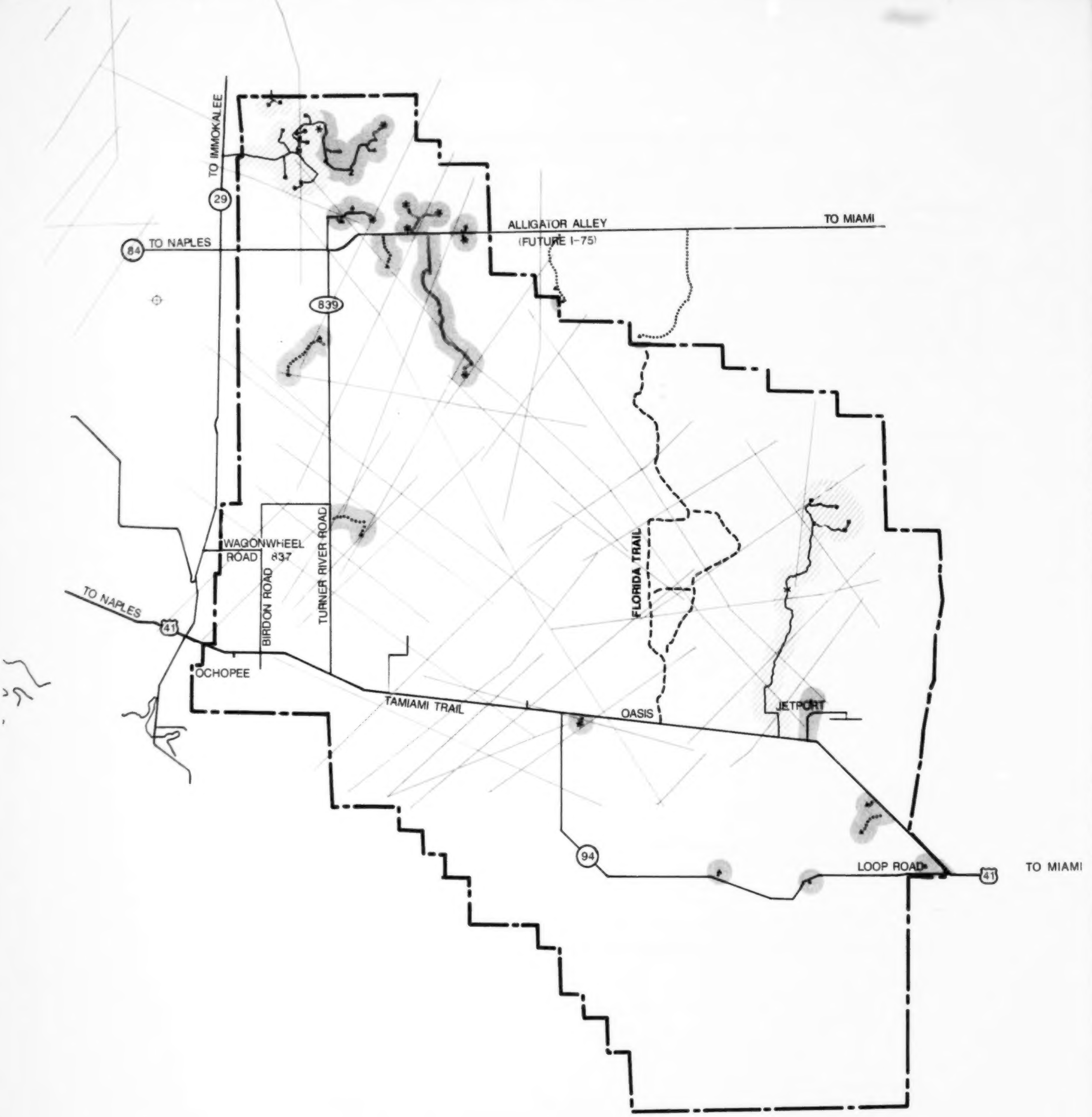
*Occupied acreage includes the actual area occupied by roads, pads, pipelines, and geophysical lines for active and inactive developments. All pipelines are along access roads except for the Raccoon Point field pipeline (2 miles within the preserve).

Average inactive pad size = 2 acres.
Average active pad size = 5 acres in Bear Island, 12 acres in Raccoon Point.
One mile of access road at 20 feet wide = 2.42 acres.
Geophysical lines = 15-foot-wide disturbance

Table 9: Oil and Gas Development Scenario, Proposed Action

Units Potentially Affected by New Surface Disturbance:	Deep Lake, Turner River, Corn Dance, Stairsteps, Loop
Number of Additional Fields:	3
Number of Wells:	
Wildcats (dry)	18
Discovery wells	3
Wells needed to develop fields	31
Field delineation wells	6
Total	58
Number of Megapads:	6
Miles of Additional Access Road and Pipeline:	40
Disturbed Acreage:	
Pads, roads, pipelines	
Existing	259
Potential	203
Total	462
Geophysical survey lines	
Existing	858
Potential	524
Total	1,382
Total Area of Oil and Gas Influence (percentage of preserve)	
Existing	38,458 (6.7)
Potential	35,486 (6.2)
Total	73,944 (12.9)*

*Even though this level of development is projected, exploration and development activities would not be permitted to affect more than 10 percent of the preserve at any one time.


TO IMMOKALEE
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84
TO NAPLES
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
839
WAGONWHEEL
ROAD 837
BIRDON ROAD
TURNER RIVER ROAD
FLORIDA TRAIL
TO NAPLES
41
OCHOPEE
TAMIAMI TRAIL
OASIS
JETPORT
94
LOOP ROAD
41
TO MIAMI

OIL AND GAS AREAS OF INFLUENCE

▨ Active Development

▒ Inactive Development

ACTIVE ROADS

•••••••••••• Abandoned Roads

|||||||||||||| Removed Roads

OIL PADS

■ Active Pads

▲ Inactive or Abandoned Pads

✱ Removed Pads

—— Known Geophysical Lines (1970–1988)

EXISTING AREAS OF INFLUENCE FOR OIL AND GAS DEVELOPMENT

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,048-A

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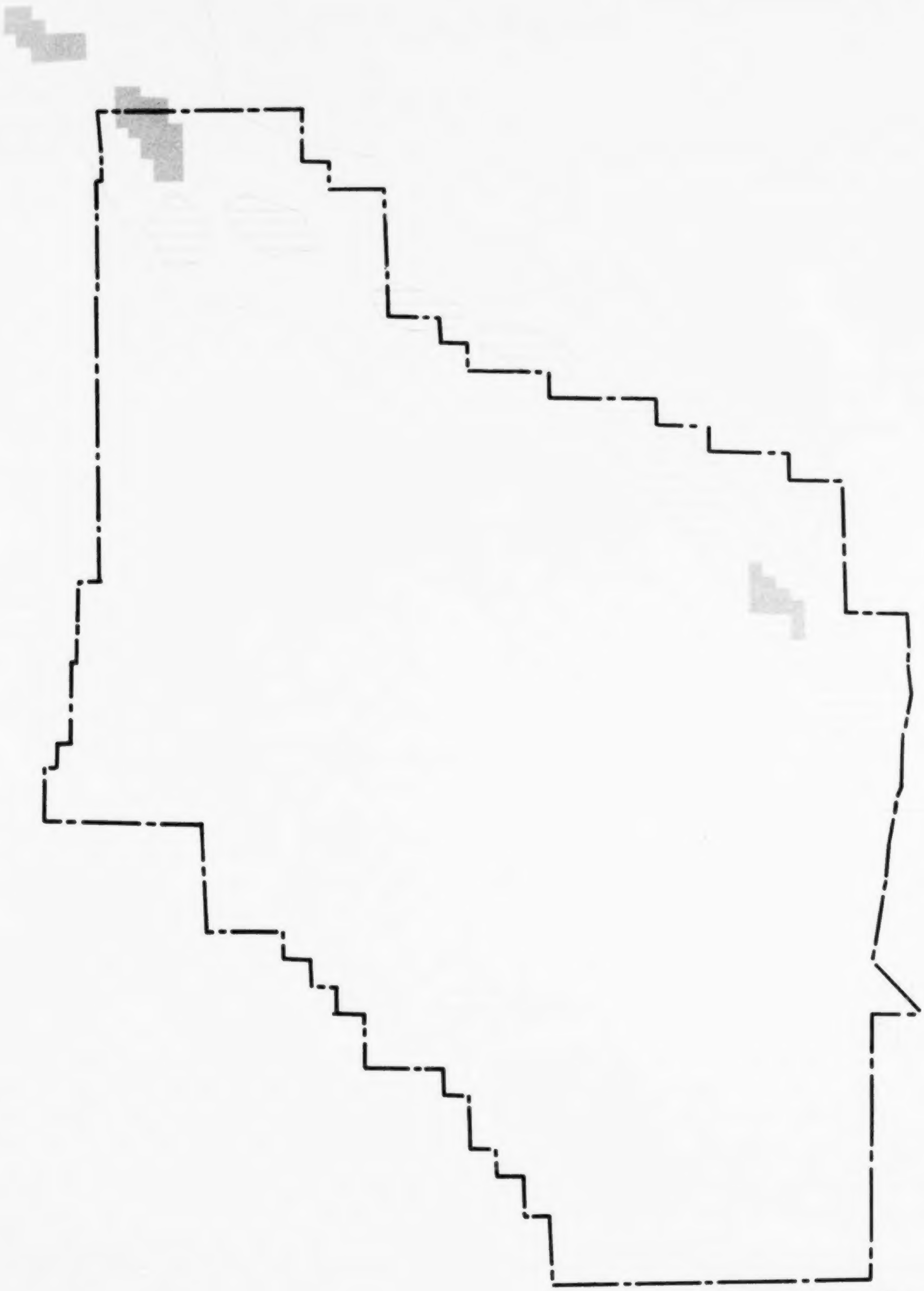


▭ Sunniland Trend

▭ Areas of Possible Reef Development and Highest Potential Concentration of Oil

▥ Areas of Past Marginal Oil Production

▨ Producing Oil Fields

POTENTIAL OIL DEVELOPMENT AREAS

BIG CYPRESS NATIONAL PRESERVE

United States Department of the Interior
National Park Service

DSC/MARCH 1989/ 176 – 20,036A

STATUS QUO ALTERNATIVE

The status quo alternative would continue existing management programs as of 1985-86 within Big Cypress National Preserve. The National Park Service would continue to respond to future needs and problems as they arose, but no major change in management direction would be initiated.

VISITOR USE

No programs would be specifically developed to enhance visitor experiences in Big Cypress. Use would continue to be primarily by hunters, ORV users, and owners of exempt inholdings, and others who are already familiar with the area. Existing recreational activities would continue to be available, including hunting, ORV use, camping, canoeing and airboating, hiking, and picnicking. Facility locations are shown on the General Development map.

Interpretation

No formal interpretive programs would be developed for the preserve. Information for visitors would continue to be provided at the Oasis ranger station, where preserve folders, regional brochures, a film, and ORV permits would be available; no other interpretive programs, however, would be offered. The Loop Road interpretive center would continue to be operated by the National Park Service; programs would consist of scheduled nature activities and tent camping opportunities for school groups in the south Florida area. Commercial operators would continue to offer visitors short guided tours by airboat or swamp buggy in portions of the preserve.

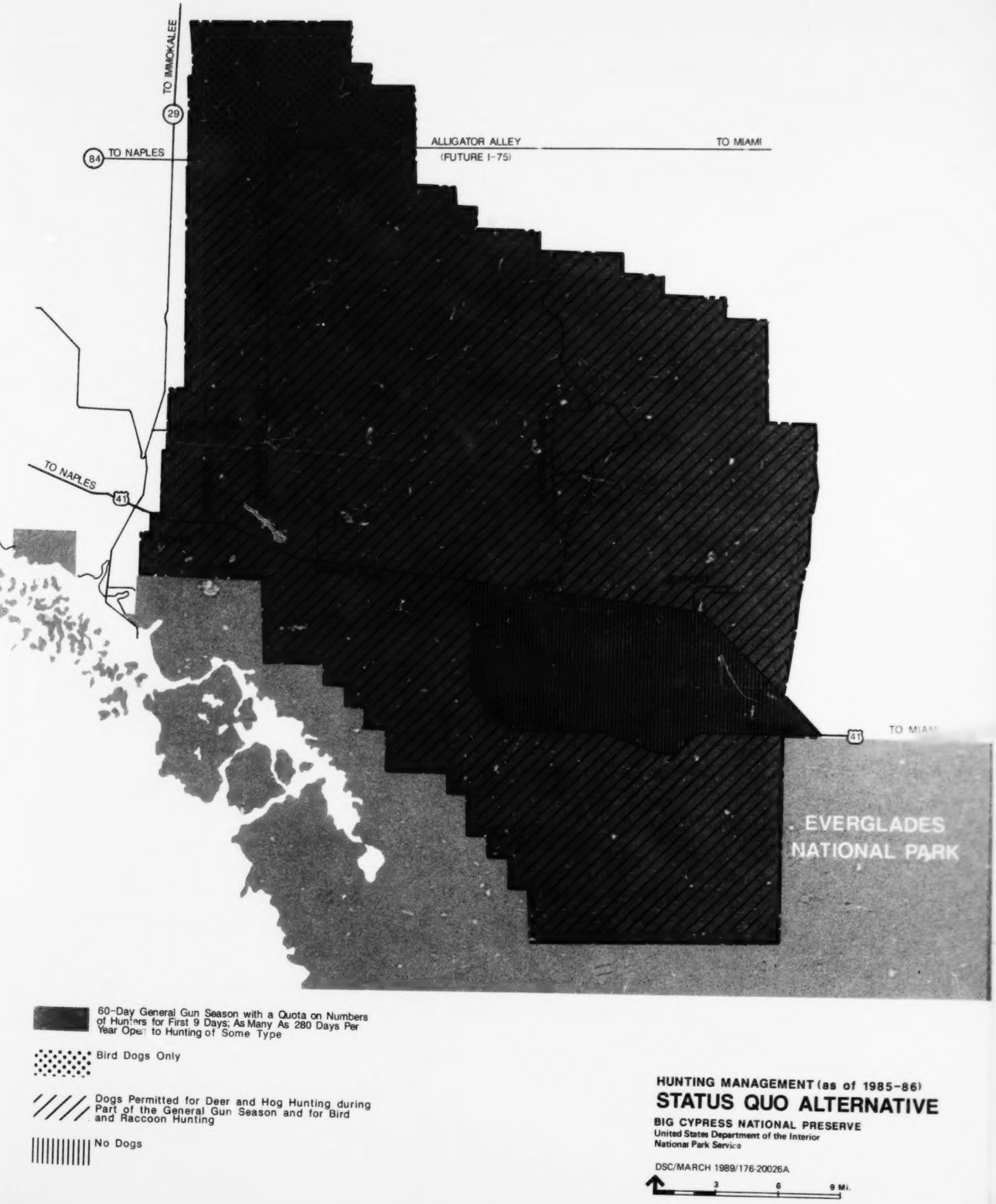
Hunting

Hunting would be permitted within Big Cypress in accordance with state and federal laws and regulations. Existing bag and possession limits would continue in force, and the present hunting seasons would continue similar to the 1985-86 season (see description of hunting in the "Affected Environment" section). Hunters would continue to be required to have a Florida hunting license and a wildlife management area stamp to hunt within the preserve. To hunt during the first nine days of the general gun or muzzle-loading gun season hunters would also be required to have quota permits.

Dogs would continue to be prohibited in the Loop unit. Only bird dogs and retrievers would be allowed in the Bear Island unit, but not other hunting dogs. Hunting dogs would only be allowed during the first nine days of the general gun season in the Turner River, Corn Dance, Deep Lake, and Stairsteps units. Raccoon hunting would be allowed in all units except the Loop and Bear Island units.

Noncommercial frogging would continue to be unrestricted.

ORVs used for hunting would continue to be required to have at least a 60-inch wheelbase, which would exclude the use of ATVs (see "ORV Use" below).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ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
TO NAPLES
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TO MIAMI
EVERGLADES NATIONAL PARK
▆ 60-Day General Gun Season with a Quota on Numbers of Hunters for First 9 Days; As Many As 280 Days Per Year Open to Hunting of Some Type
⁘ Bird Dogs Only
//// Dogs Permitted for Deer and Hog Hunting during Part of the General Gun Season and for Bird and Raccoon Hunting
|||| No Dogs
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HUNTING MANAGEMENT (as of 1985–86)

STATUS QUO ALTERNATIVE

BIG CYPRESS NATIONAL PRESERVE

United States Department of the Interior
National Park Service

DSC/MARCH 1989/176-20026A

ORV Use

Existing regulations governing ORV use would continue under the status quo alternative. For the most part, ORV access would be unregulated except in the Bear Island unit, where ORVs would have to enter by way of Turner River Road. ORV use would continue to be prohibited in the Loop unit and on the Florida trail and the Eleven Mile Road. Existing regulations (36 CFR 1.5) would continue to be enforced, and ORV use would not be restricted to designated trails. As at present, an annual $25 ORV permit would be required for driving in the preserve.

Other Recreational Activities

Camping would continue at five NPS locations, all of which would remain undeveloped (no water, electricity, permanent toilets, or garbage service; see General Development map). An undeveloped campground area in the Bear Island unit would continue to be used by hunters during the fall, and portable toilets would be provided.

No canoe trails would be designated. The trailhead of the Florida National Scenic Trail at the Oasis ranger station would remain where it is now. Counter to existing regulations, sections of the hiking trail would continue to be used as ORV trails. No additional picnic areas would be provided in the preserve.

NATURAL RESOURCE MANAGEMENT

Hydrology

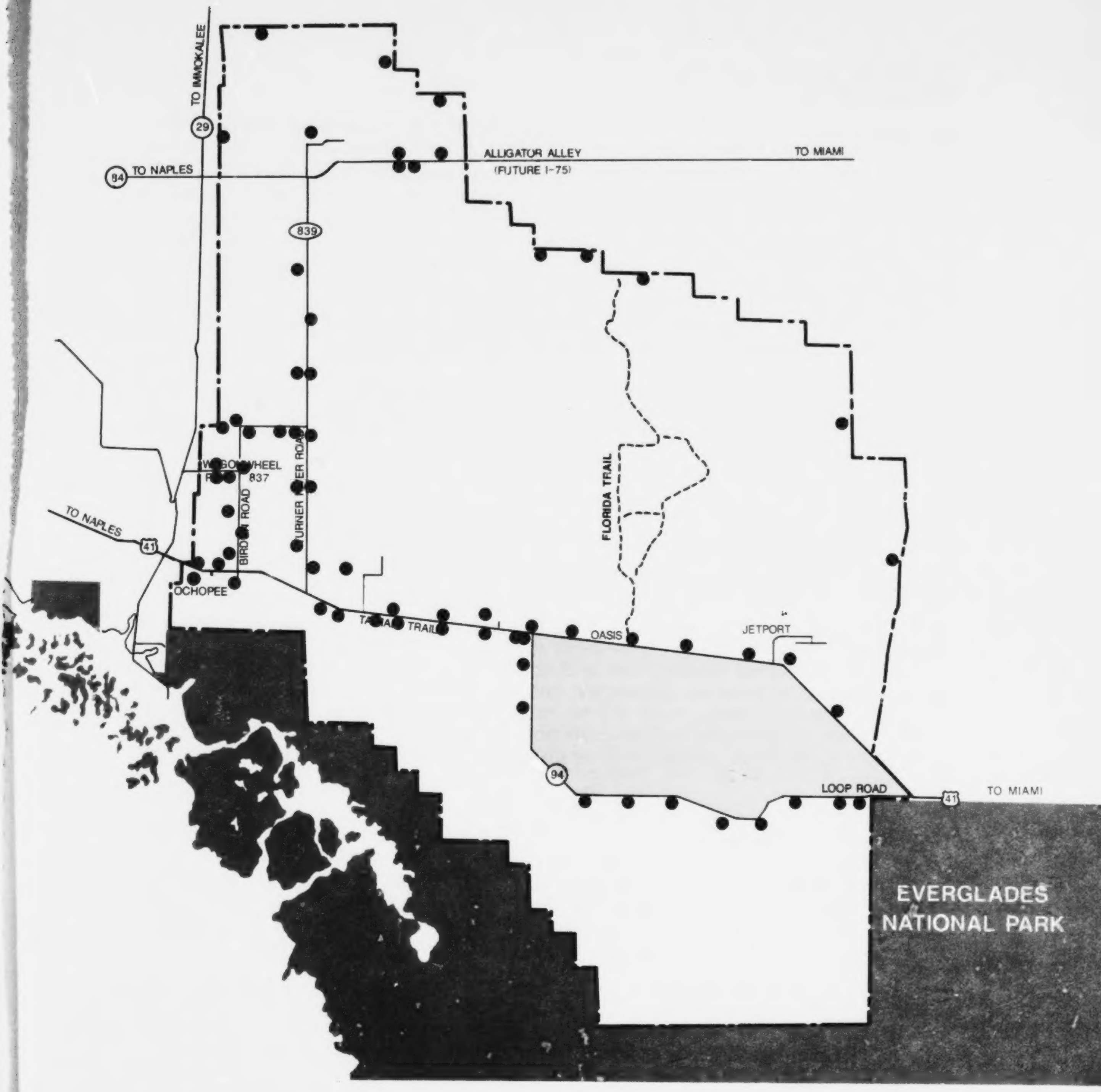
The overall direction of hydrological management under the status quo alternative would be to continue to avoid or mitigate potential disturbances to water resources. However, the effects of existing canals, roads, and other influences on water resources would not be mitigated.

As described under the proposed action, the National Park Service would continue to operate monitoring stations to provide baseline hydrological data and early warnings of problems.

Oil and gas plans of operations and improved property development or use permits would be closely monitored to ensure the protection of hydrological resources. In cases where persistent threats were not corrected, condemnation procedures would be initiated.

No new NPS developments would be provided, so there would be no additional filling or dredging.

The current hydrological conditions associated with the Turner River and Birdon Road canals and the Loop Road would be accepted as baseline conditions, and no further restoration actions would be taken.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OCHOPEE
TAMIAMI TRAIL
OASIS
JETPORT
94
LOOP ROAD
41
TO MIAMI
EVERGLADES NATIONAL PARK

● Frequently Used Unimproved ORV Access Point

☐ Unrestricted ORV Use

▨ Closed to ORV Use

ORV MANAGEMENT (as of 1985-86)

STATUS QUO ALTERNATIVE

BIG CYPRESS NATIONAL PRESERVE

United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,027 -A

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Minerals

Under the status quo alternative existing oil and gas operations throughout the preserve would be controlled through NPS regulations at 36 CFR 9B. Individual new proposals, in the form of plans of operations, would be reviewed and modified to minimize immediate and localized impacts under the requirements of the regulations. The cumulative impacts of each new proposal would be analyzed, as is also required by the regulations, but no development limits would be established, as would be done under the other alternatives. Also, no restrictions would be placed on development in the Bear Island unit. Important resource areas would be protected when and where possible, and mitigation would be required where degradation of these resources was likely to occur.

Based on the area of influence concept described in appendix B, existing oil and gas exploration and development in the preserve has directly and indirectly affected 38,458 acres, or 6.7 percent of the preserve. The additional area of influence related to potential future oil and gas exploration and development, based on the scenario for this alternative, is estimated to be approximately 38,036 acres, or 6.6 percent of the preserve. The total area of influence for exploration and development under the status quo alternative would therefore be 76,494 acres, or 13.3 percent of the preserve. Neither an acceptable level for oil and gas exploration and development, nor an area of influence limit, would be defined under this alternative. A minerals management plan reflecting this unrestricted level of exploration and development would be prepared under this alternative.

In the event the National Park Service rejects a plan of operations because it would be detrimental to the purposes of the preserve or because of anticipated unacceptable levels of environmental impact resulting from such operations (i.e., the existing regulations cannot provide the level of protection necessary) and the denial is viewed as a potential for the taking of property interests, funds will be sought from Congress to acquire the affected mineral estate. If funds are not made available for acquisition within a reasonable period of time, the oil and gas operation will be allowed to proceed under reasonable rules and regulations.

Vegetation

No specific programs would be undertaken for protected plant species (see tables 20 and 21 in the "Affected Environment"). As described under the proposed action, these species would be expected to benefit from continuing actions to maintain natural water regimes, allow prescribed burning and managed wildfires, and control exotic species.

Control programs for exotic plants would continue at present levels, and about 1,000 acres annually would be treated.

Fire Management

The current fire management program for the preserve would continue in effect. Management fires would be set under carefully controlled, prescribed conditions to reduce hazardous fuel accumulations around properties and in high arson areas, to improve pasturage on grazing leases, to maintain habitat for Cape Sable seaside sparrows and red-cockaded woodpeckers, and to research the effects of fire on prairie vegetation. Total acreage of annual prescribed burns would be between 9,000 and 25,000 acres. Wildfires or management fires exceeding prescriptions would be suppressed when possible.

Wildlife

As described under the proposed action, most of the protected species in Big Cypress (see tables 22 and 23 in the "Affected Environment") would be protected by actions to maintain natural water regimes, continue prescribed burning and prescribed natural fire, control exotics, and protect resources from unlawful collection. Specific management programs would be considered for four species.

Florida Panther. Under this alternative the protection of the Florida panther would continue to be considered in preserve operations, but hunting regulations, ORV regulations, and fire management would not be changed specifically to improve conditions for the panther. The status of the panther would continue to be considered in permitting oil and gas operations on a case-by-case basis.

NPS-sponsored panther research teams would continue to monitor the status of the population from tracks and other sign. The National Park Service would continue to cooperate with the Florida Game and Fresh Water Fish Commission in panther and prey species research, but a comprehensive research program would not be developed.

Cape Sable Seaside Sparrow. Cape Sable seaside sparrow management would continue as at present. Monitoring of the population and prescribed burning of habitat would be on an unscheduled, "as needed" basis.

Red-Cockaded Woodpecker. Current management of the red-cockaded woodpecker would continue. As described in the proposed action, management would include the annual monitoring of the woodpecker population, prescribed burning of known habitat, and prohibition of oil and gas activity near cavity trees.

***Liguus* Tree Snails.** Programs would continue as before the recent moratorium on snail collecting. There would be a $5 fee for a collecting permit, and collectors would have to submit an annual data sheet quantifying collecting activities. Collectors would be encouraged, but not required, to take no more than 10 shells per color form per day. Transferal of color forms between hammocks would be prohibited. Snail habitat in hardwood hammocks would continue to be protected from fire.

Deer and Hogs. Under the status quo alternative no actions would be taken specifically to improve white-tailed deer or feral hog habitat. However, both populations would incidentally benefit from continued prescribed burning and prescribed natural fires. Monitoring of deer and hog populations would continue to be based primarily on check station data.

Exotic Species. The National Park Service could take specific actions to respond to a crisis situation, but there would be no overall control program for exotic animals.

CULTURAL RESOURCE MANAGEMENT

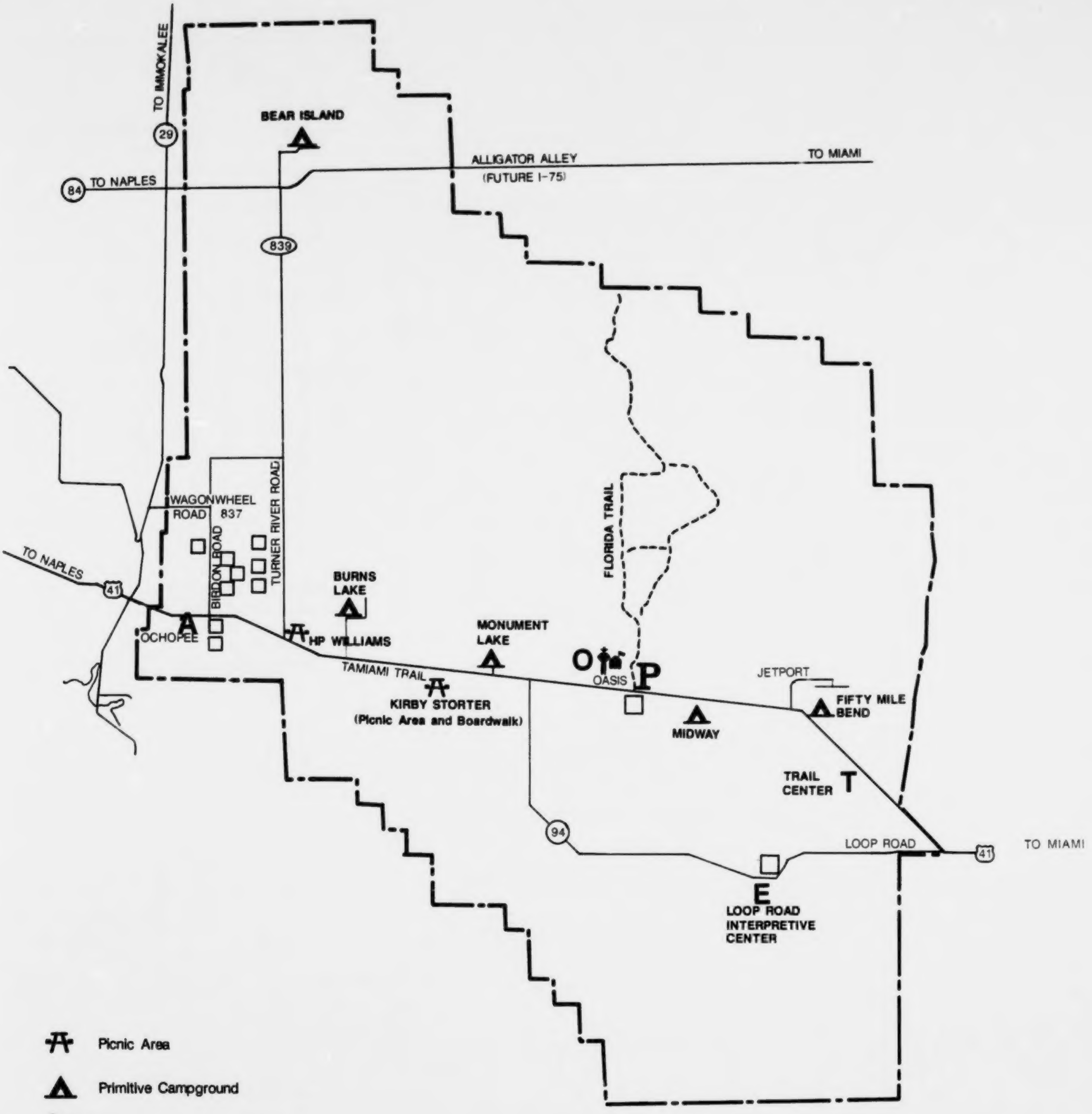
The preserve would continue to be operated under a passive management or benign neglect philosophy, except in cases of impacts related to human activity such as construction or oil and gas development. These direct impacts to resources would be mitigated through avoidance. Actions to eliminate vandalism and exotic plant and animal disturbances would be minimal. The status quo alternative would not fulfill the intent of NPS policy, nor would it meet the requirements of existing cultural resource management laws and regulations.

GENERAL DEVELOPMENT

Visitor facilities in the preserve would include Oasis (which would provide permits for hunting and ORV use, plus basic visitor contact functions) and Kirby Storter Roadside Park (which would continue to provide the only on-site visitor experience).

No new development would be undertaken within the preserve (see the General Development map). Five NPS areas would continue to be used for primitive frontcountry camping without water, electricity, permanent toilets, or garbage services. No additional interpretive trails or hiking trails would be provided, and no access or road improvements would be undertaken as part of the general management plan.

Oasis would continue to be the center for operations (see the Oasis Development Concept Plan map for this alternative). There would be no permanent residential facility on-site. Ochopee would continue to be the center for administrative operations and staff housing (see the Ochopee Development Concept Plan map). The outlying residential units would be retained. The existing water treatment plant at Ochopee would be maintained.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BURNS
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OCHOPEE
HP WILLIAMS
MONUMENT
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OASIS
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TAMIAMI TRAIL
KIRBY STORTER
(Picnic Area and Boardwalk)
JETPORT
FIFTY MILE
BEND
MIDWAY
TRAIL
CENTER
T
94
LOOP ROAD
41
TO MIAMI
E
LOOP ROAD
INTERPRETIVE
CENTER

╤	Picnic Area
▲	Primitive Campground
👤	Ranger Station/Visitor Contact
E	Environmental Education Center
P	Trailhead Parking
A	Ochopee Administrative/Residential Area
O	Oasis Operations Center
T	Trail Center Residential Area (Operated by Everglades National Park)
☐	Outlying Employee Housing

GENERAL DEVELOPMENT (as of 1985-86)

STATUS QUO ALTERNATIVE

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

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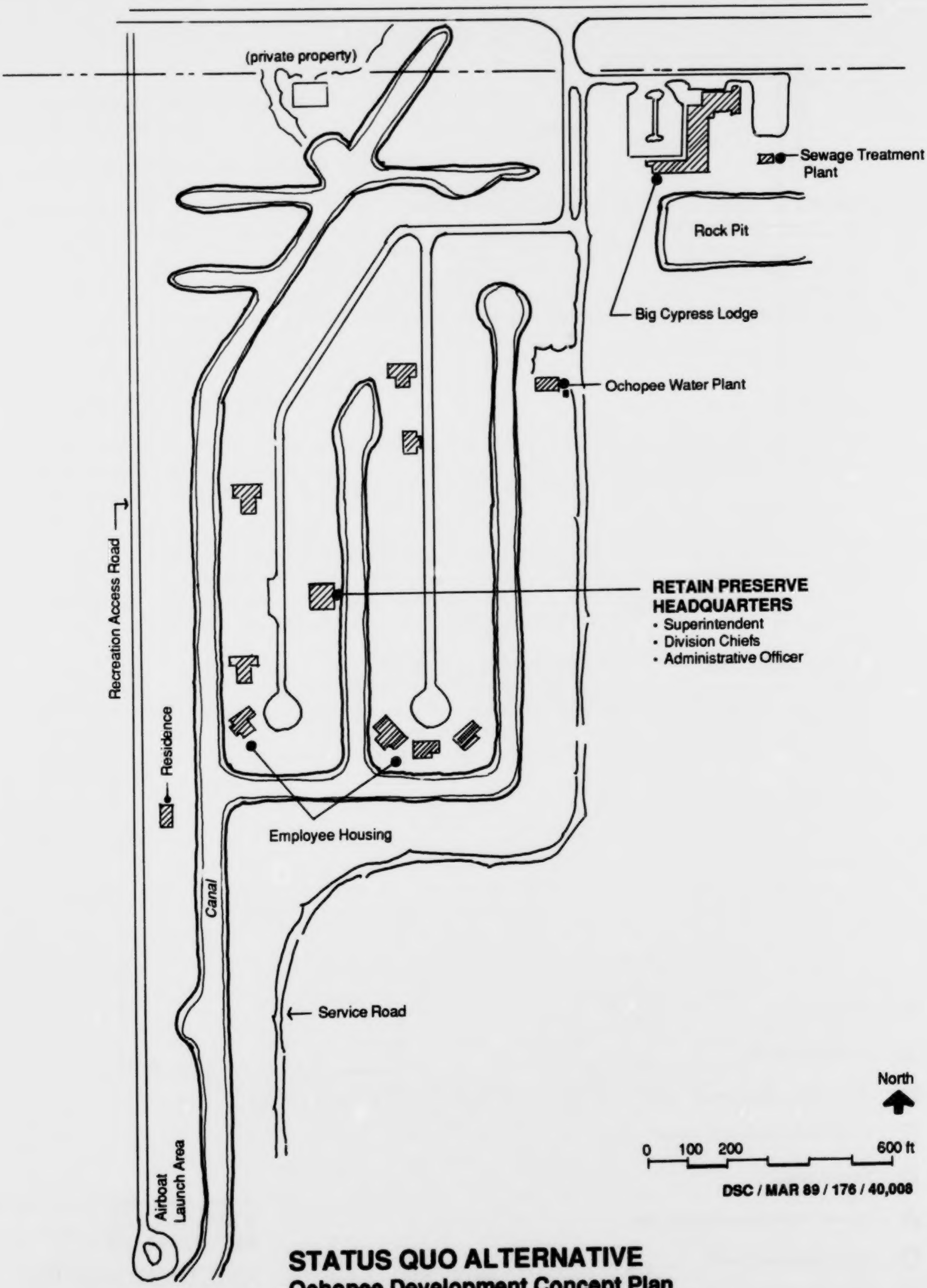
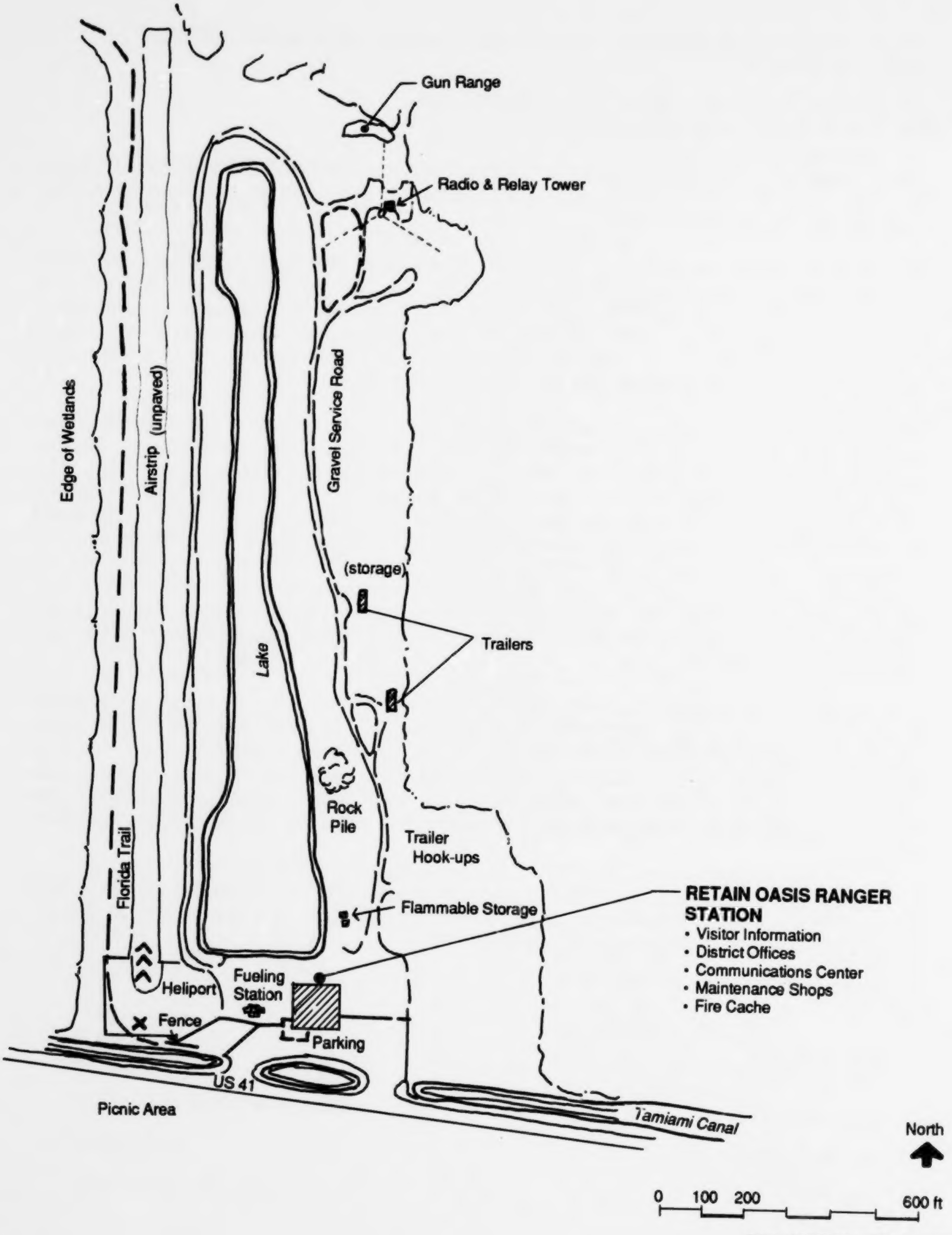

(private property)
Sewage Treatment Plant
Rock Pit
Big Cypress Lodge
Ochopee Water Plant
Recreation Access Road
RETAIN PRESERVE HEADQUARTERS
• Superintendent
• Division Chiefs
• Administrative Officer
Residence
Employee Housing
Canal
Service Road
Airboat Launch Area
North
0
100
200
600 ft
DSC / MAR 89 / 176 / 40,008

STATUS QUO ALTERNATIVE
Ochopee Development Concept Plan
Big Cypress National Preserve / Florida


Gun Range
Radio & Relay Tower
Edge of Wetlands
Airstrip (unpaved)
Gravel Service Road
(storage)
Trailers
Lake
Rock Pile
Trailer Hook-ups
Florida Trail
Flammable Storage
Heliport
Fueling Station
Fence
Parking
US 41
Picnic Area
Tamiami Canal
North
0
100
200
600 ft

RETAIN OASIS RANGER STATION

- Visitor Information
- District Offices
- Communications Center
- Maintenance Shops
- Fire Cache

DSC / MAR 89 / 176 / 40,010

STATUS QUO ALTERNATIVE
Oasis Development Concept Plan
Big Cypress National Preserve / Florida

PROBABLE SCENARIO WITH IMPLEMENTATION OF THE STATUS QUO ALTERNATIVE

Table 10 lists the acreages affected by existing NPS development. Sources for estimates for ORV trails, fire management, and exotic plants are the same as described under the scenario for the proposed action.

As described under the proposed action, the oil and gas development scenario assumes the existence of economically valuable oil and gas reserves and a demand for the development of those reserves over the next 15 years. It also assumes possible development in three areas – low-potential areas off the Sunniland trend, medium-potential areas on the trend but not on reef development areas, and high-potential areas of possible reef development also on the trend.

The scenario for the status quo alternative is based on a historical projection that uses existing well locations and the drilling pace of wells inside the preserve, as well as success ratios of wells drilled both inside and outside the preserve from 1967 to 1985 and economic fluctuations since 1967. The projections indicate that during the next 15 years, 23 exploratory (wildcat) and discovery wells could be drilled, one small field could be discovered off the trend, an average-size field (1,920 acres of drained oil and 12 wells, based on an analysis of existing fields all along the Sunniland trend) could be discovered on the trend, and a larger-than-average field could be discovered on the trend within areas of possible reef development. The projection also indicated that 31 wells could be drilled to develop the three fields plus six delineation wells, all contained on six megapads (see table 11).

The scenario also projects that 433 miles of geophysical lines would be run or proposed during the next 15 years. The total miles projected include three large lines (139 miles each) and two small lines (8 miles each). Since large lines have historically covered much of the preserve, it is difficult to project where the new lines might be placed (see the Existing Areas of Influence for Oil and Gas Development map). The smaller site delineation lines would most likely be proposed in the preserve portion of the Sunniland trend.

The potential area of influence for this level of development is estimated to be 38,036 acres. When added to the existing area of influence (38,458), the total would be 76,494 acres (13.3 percent of the preserve; see table 11).

Table 10: Scenario for the Status Quo Alternative, Existing Conditions

General Development	Acreage Occupied by Existing NPS Development	Cover Type Affected
Ochopee Headquarters Area		
Big Cypress Lodge (partially renovated)	97.0	Disturbed land
Water plant		
Headquarters building		
Housing – 9 existing units		
Utilities – electric lines, waterlines, and individual septic tanks		
Associated facilities	4.0	Disturbed land
10 outlying residences		
4 trailer pads		
Oasis Visitor Center/Operations Center		
Picnic tables (2)	44.0	Disturbed land
Oasis ranger station		
Landing strip (unpaved)		
Flammable materials storage		
Well house		
Trailers (2)		
Associated facilities	3.0	Disturbed land
Woodshop		
8 residences		
ORV access points	(no formal access points; approximately 70 informal points)	
Boat ramp (undeveloped)		
Seagrape Drive (Ochopee)	0.3	Disturbed land
Campgrounds (informal, undeveloped)		
Burns Lake	14.0	Disturbed land
Monument Lake	17.0	Disturbed land
Midway	9.0	Disturbed land
Fifty Mile Bend	11.0	Disturbed land
Bear Island	5.5	Disturbed land
Picnic Area		
Kirby Storter		Disturbed land
H. P. Williams		Disturbed land
Loop Road Interpretive Center	6.0	Disturbed land
Loop Road	55.0	Disturbed land
Trail Center Housing	16.0	Disturbed land
Total	**281.8**	

Off-Road Vehicle Management	Estimated Trail Miles	Estimated Trail Acres
Bear Island	90	160
Deep Lake	120	215
Turner River	410	740
Corn Dance	120	215
Loop	0	0
Stairsteps	500	900
Total	1,240	2,230

Exotic Plant Control	Acreage Infested	Acreage Treated	Average Acreage Treated Annually
Melaleuca	38,400	3,578	1,000
Australian pine	30	43	12
Brazilian pepper	400	18	5

Fire Management	Annual Acreage Burned
Prescribed Fire	2,500-9,000
Wildfire	10,000 (average)

Table 11: Oil and Gas Development Scenario, Status Quo Alternative

Units Potentially Affected by Surface Disturbance:	All
Number of Additional Fields:	3
Number of Wells:	
Wildcats (dry)	20
Discovery wells	3
Wells needed to develop fields	31
Field delineation wells	6
Total	60
Number of Megapads:	6
Miles of Additional Access Road and Pipeline:	40
Disturbed Acreage:	
Pads, roads, pipelines	
Existing	259
Potential	215
Total	474
Geophysical survey lines	
Existing	858
Potential	524
Total	1,382
Total Area of Oil and Gas Influence (percentage of preserve):	
Existing	38,458 (6.7)
Potential	38,036 (6.6)
Total	76,494 (13.3)

ALTERNATIVE A

Under alternative A Big Cypress would continue to play a primary role in providing regional recreational opportunities. Important resource areas would be given adequate protection and would become a focus of the preserve's new interpretive program. A variety of on-site experiences would be provided as part of this new interpretive effort.

VISITOR USE

Alternative A would be identical to the proposed action, except a few additional visitor opportunities and services would be provided. Compared to the proposed action, alternative A would provide user groups and the visiting public with a fuller range of opportunities to hunt, use ORVs, fish, and sightsee.

Interpretation

All visitors would be encouraged to use, explore, and learn about Big Cypress. Wayside orientation/information exhibits would be located at the three sites discussed under the proposed action (two on US 41 and one on Florida 84). An additional orientation/information exhibit would be placed at the proposed Cypress Lane ORV access/staging area (between mile-markers 31 and 32 on proposed I-75).

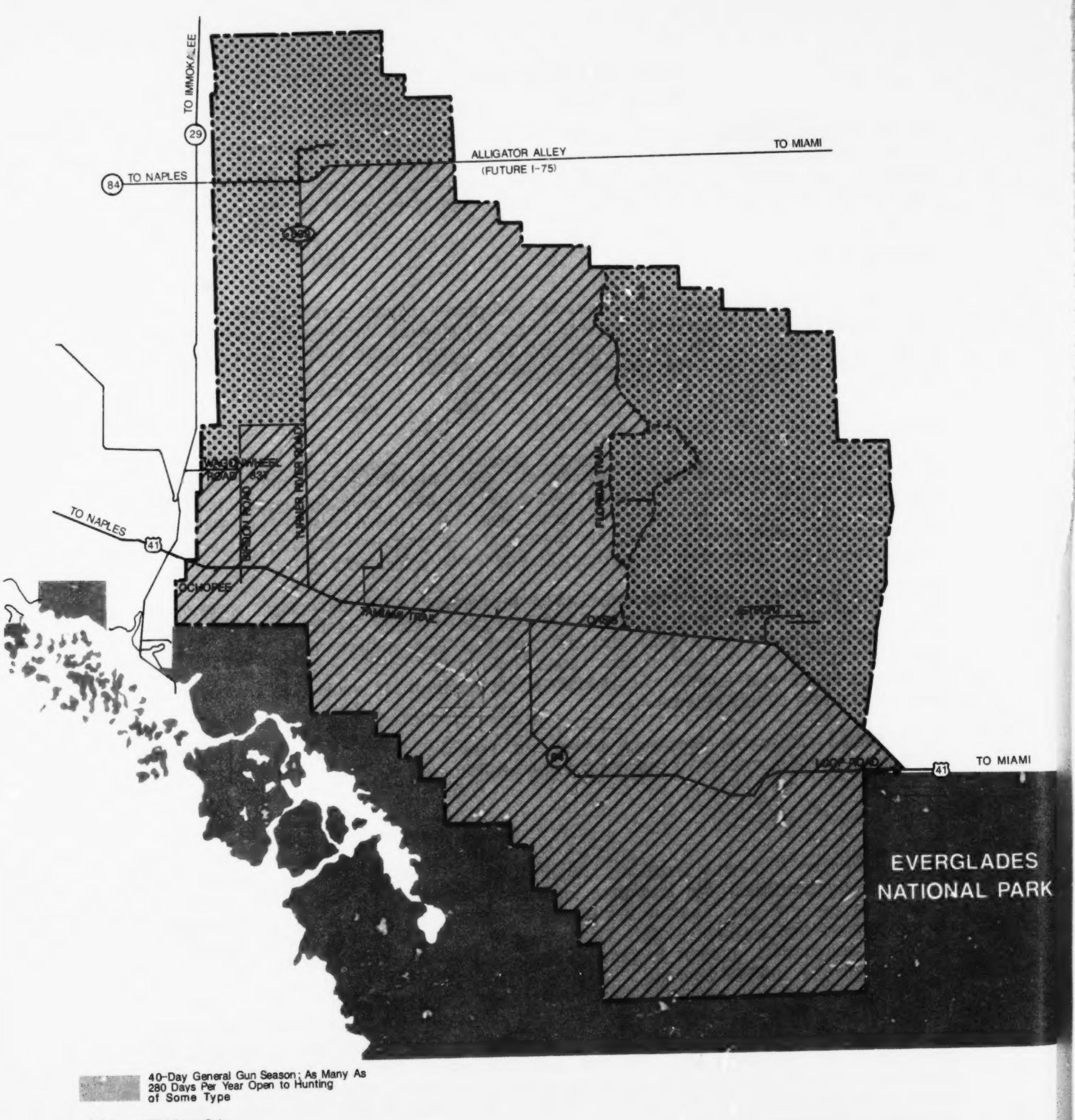
Interpretive programs within the preserve would be focused at the Oasis visitor center, as described under the proposed action. Like the proposed action, interpretive trails would be provided along the Loop Road, but under alternative A interpretation would also be offered along Perocchi Grade and Bear Island Road in the Bear Island unit, which would be open to street-legal vehicles. This additional interpretive road would give visitors more chances to see a variety of wildlife.

As described under the proposed action, an educational outreach program would describe resource management programs and how visitors can use the preserve.

Hunting

Under alternative A hunting proposals would offer more protection to the panther than under existing conditions, but less than under the proposed action. Like the proposed action, the general gun season would be limited to 40 days, and a full-season, nontransferable quota permit system for hunters would be initiated. Hunting regulations would be adjusted to attempt to produce a preservewide harvest by all methods at approximately the 1980-86 average.

For the first time in over 10 years deer and hogs could be hunted with dogs in the Loop unit during the first nine days of the general gun season. Dogs would also continue to be permitted in the Stairsteps unit. Like the proposed action, deer and hog hunting with dogs would still be prohibited in the three units (Bear Island, Corn Dance, and Deep Lake) most frequented by the panther. Hunters could use a light and dogs to hunt raccoons at night except in the Bear Island, Deep Lake, and Corn Dance units.


TO IMMOKALEE
29
84
TO NAPLES
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
839
WAGONWHEEL ROAD
837
BIRDON ROAD
TURNER RIVER ROAD
FLORIDA TRAIL
TO NAPLES
41
OCHOPEE
TAMIAMI TRAIL
OASIS
AIRPORT
94
LOOP ROAD
41
TO MIAMI
EVERGLADES
NATIONAL PARK

▨ 40-Day General Gun Season; As Many As 280 Days Per Year Open to Hunting of Some Type

⠿ Bird Dogs Only

//// Dogs Permitted for Deer and Hog Hunting during Part of the General Gun Season and for Bird and Raccoon Hunting

NOTE: Numbers of Hunters for All Seasons Would Be Controlled by a Full-Season Quota System

HUNTING MANAGEMENT
ALTERNATIVE A

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,029-A

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ORV Use

Under alternative A dispersed ORV use would continue over most of the preserve. Existing regulations (36 CFR 1.5) would continue to be enforced, including the provision for an annual use permit. The management of ORV use would differ from the current situation (the status quo alternative) in that approximately 50 access points would be designated, and 19 of these would be improved (see ORV Use map for alternative A).

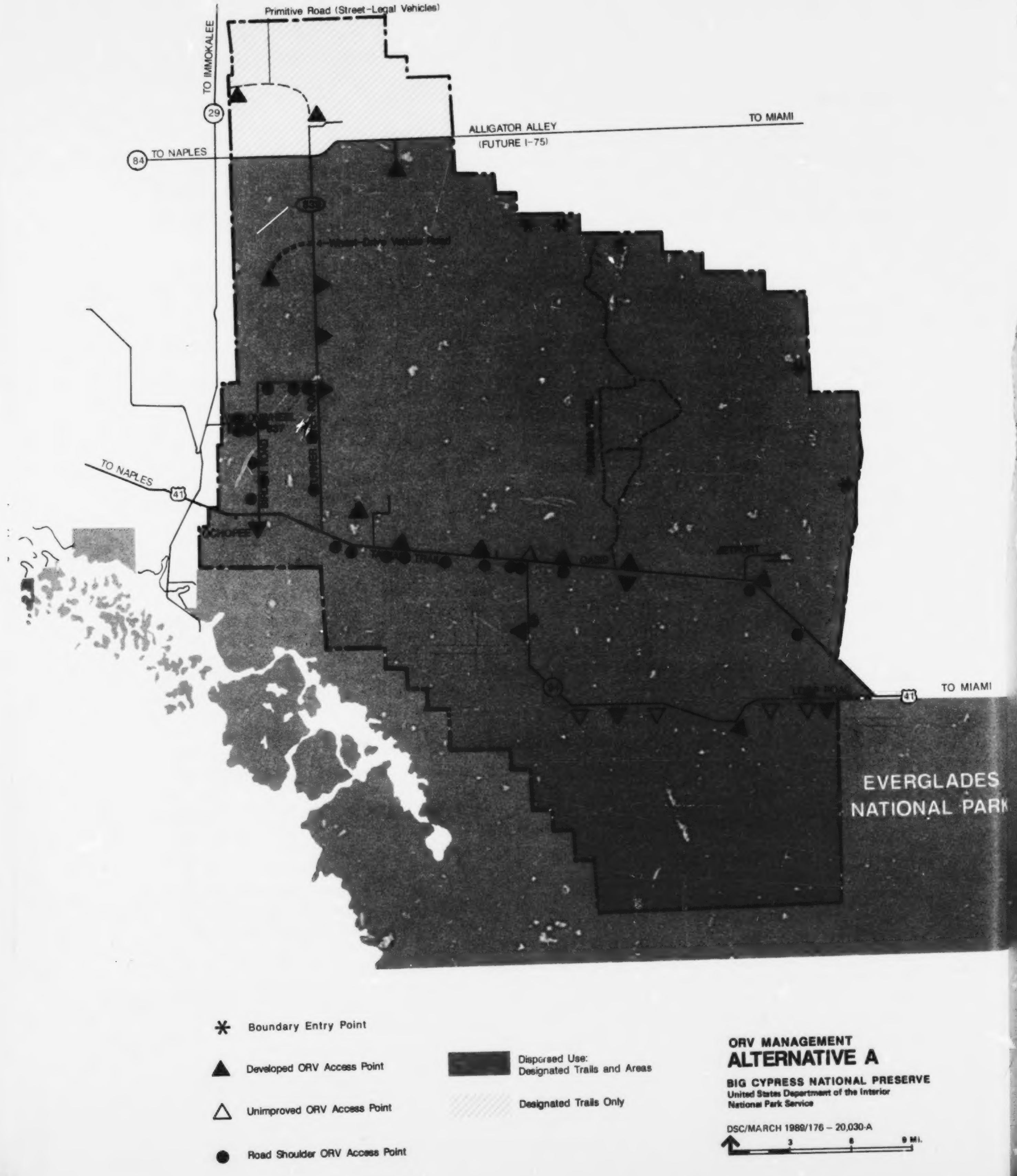
In the Deep Lake, Turner River, Corn Dance, and Stairsteps units ORV use would essentially continue as at present except that at selected sites (less than 20 percent of existing trails) actions would be taken to locally control ORV impacts. These sites would include trail segments or open areas where (1) vehicle use was causing expansive ponding or erosion; (2) multiple trails cut through sloughs, strands, or ponds; (3) cultural resources might be threatened by vandalism or erosion; or (4) other chronic resource problems were evident. In some cases designated segments could be raised or corduroyed to provide a firmer treadway and to control damage to soils and vegetation. Care would be taken at such sites to accommodate sheet flow and to avoid interference with airboat use in higher water.

Associated with designated trail segments, nearby segments or areas where sustained resource damage had occurred would be closed to allow recovery. Some heavily damaged areas would be actively reclaimed through plantings, restoration of soils, or removal of obstructions to sheet flow. The Loop unit, currently closed to ORV use, would be reopened, and ORV use would be managed consistent with the other units.

To reduce any potential disturbance to panther habitat in the Bear Island unit, ORVs would be restricted to a system of designated trails following existing roads and trails. Perocchi Grade and Bear Island Road, which connect the Turner River Road with Florida 29, would be upgraded to a two-way primitive road for street-legal vehicles. An ORV parking and staging area would be constructed near the preserve boundary on the Bear Island Road (approximately 15 cars and trailers) and at the entrance to Perocchi Grade at the Bear Island campground (approximately 15 cars and trailers).

In the Deep Lake unit the Wainco oil road would be maintained for ORV use, and the existing abandoned pads would be converted to a primitive, ORV-accessible campground.

In the Turner River unit the National Park Service would cooperate with the Florida Department of Transportation and the Federal Highway Administration to construct an interchange on Florida 84 (I-75) at Cypress Lane (between mile-markers 31 and 32). A rest area would be constructed within the I-75 right-of-way for 50 vehicles, and an orientation exhibit would be provided. The National Park Service would improve Cypress Lane as a two-lane paved road for street-legal vehicles. An ORV parking/staging area for up to 50 cars and trailers would be constructed near the southern end of Cypress Lane.


Primitive Road (Street-Legal Vehicles)
TO IMMOKALEE
29
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
84
TO NAPLES
839
4-Wheel-Drive Vehicle Road
TO NAPLES
41
OCHOPEE
TAMIAMI TRAIL
OASIS
AIRPORT
94
LOOP ROAD
41
TO MIAMI
EVERGLADES
NATIONAL PARK
Boundary Entry Point
Developed ORV Access Point
Unimproved ORV Access Point
Road Shoulder ORV Access Point
Dispersed Use: Designated Trails and Areas
Designated Trails Only
3
6
9 MI.

ORV MANAGEMENT

ALTERNATIVE A

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,030-A

Other Recreational Activities

Frontcountry camping would be provided at seven primitive campgrounds. Six camping areas would be provided as described under the proposed action, except the Midway fill-pad would be developed rather than Dona Drive. In addition, group camping would also be allowed at the Pinecrest ranger station. The Pinecrest camping area would give more visitors the opportunity to explore one of the lesser known areas of the preserve.

Undesignated backcountry camping would be allowed in all units of the preserve except Bear Island, where designated camping would be maintained to reduce the level of human intrusion in a known panther area.

Opportunities for canoeing and picnicking would be the same as described under the proposed action. Three canoe put-in areas would be provided (Forty Mile Bend, Trail Center, and Turner River), and picnic facilities at Oasis would be improved.

Hiking opportunities would be similar to the proposed action. However, the Florida National Scenic Trail would be rerouted so that the terminus would be at the Ochopee headquarters building instead of the Oasis visitor center. This rerouting would allow the hiking trail to connect with the Wilderness Waterway canoe trail in Everglades National Park.

NATURAL RESOURCE MANAGEMENT

Hydrology

Hydrological management would be the same as described under the proposed action except for actions affecting the Loop Road area. The Loop Road would be upgraded to provide an improved, all-season road (see the "General Development" section for this alternative). Upgrading the road would require new drainage structures to provide for water flows.

As described in the proposed action, permits from the U.S. Army Corps of Engineers and the state of Florida would be required for fill operations to ensure the protection of the preserve's hydrological integrity. No dredging for fill material would occur within the preserve. Fill material would be acquired from approved commercial sources or possibly through cooperative agreements with regional agencies by reducing abandoned levees or other spoil areas that are hydrological obstructions.

Minerals

Under alternative A only 10 percent of the preserve would be subject to the influences of oil and gas development at any one time, as described under the proposed action. Existing oil and gas exploration and development activities throughout the preserve would be controlled by NPS regulations at 36 CFR 9B. New plans of operations would be reviewed and modified to minimize immediate and localized impacts, and the cumulative impacts of each new proposal would be analyzed. The entire preserve would be open to oil and gas development. Important resource areas would be protected when and where possible, and adverse effects would have to be mitigated where degradation of these resources was likely to occur. A minerals management plan would be developed under this alternative to control oil and gas development.

As described for the proposed action and the status quo alternative, existing oil and gas development directly and indirectly influences an estimated 38,458 acres, or 6.7 percent of the preserve. As described for the status quo alternative, potential geophysical exploration and development activities could influence an estimated 38,036 additional acres, or 6.6 percent of the preserve, for a total of 76,494 acres, or 13.3 percent of the preserve. However, since no more than 10 percent of the preserve could be influenced by oil and gas activities at any one time, some exploration and development proposals would be delayed if they would result in the limit being exceeded until other sites were reclaimed. Proper reclamation of abandonded access roads, pads, pipeline corridors, and geophysical survey lines would allow for new developments to occur, as long as the 10 percent limit was not exceeded.

In the event the National Park Service rejects a plan of operations because it would be detrimental to the purposes of the preserve or because of anticipated unacceptable levels of environmental impact resulting from such operations (i.e., the existing regulations cannot provide the level of protection necessary) and the denial is viewed as a potential for the taking of property interests, funds will be sought from Congress to acquire the affected mineral estate. If funds are not made available for acquisition within a reasonable period of time, the oil and gas operation will be allowed to proceed under reasonable rules and regulations.

Vegetation

Species listed in tables 20 and 21 in the "Affected Environment" would continue to be protected. These species would be expected to benefit from actions to maintain natural water regimes, allow prescribed burning and managed wildfires, and control exotic species.

Control programs for exotic plants would be the same as those described for the proposed action.

Fire Management

Management of prescribed burning and prescribed natural fires, and the suppression of wildfires, would be the same as described for the proposed action.

Wildlife

As described under the proposed action, most of the protected wildlife species in Big Cypress (see tables 22 and 23 in the "Affected Environment") would benefit by actions to maintain natural water regimes, allow prescribed fires, control exotics, and protect species from unlawful collection. Proposals for the Cape Sable seaside sparrow, the red-cockaded woodpecker, *Liguus* tree snails, white-tailed deer and hogs, and exotic species would be the same as those described under the proposed action. Specific management actions for the Florida panther would be implemented as described below.

Hunting pressure would be more closely controlled in panther habitat than at present by initiating a full-season quota on the numbers of hunters in the preserve. Like the proposed action, dogs would be prohibited for deer or hog hunting in the Bear Island, Deep Lake, and Corn Dance units, where there are known resident panther populations; hunting dogs would be permitted, however, in the Turner River, Stairsteps, and Loop units.

Potential disturbance to Florida panther habitat would be controlled in Bear Island by restricting ORVs to designated trails. In the remainder of the preserve, including the Deep Lake and Corn Dance units, dispersed ORV use would be encouraged, and ORV use would be expanded by allowing access off I-75 and reopening the Loop unit to ORVs (see "ORV Use" for this alternative). The Park Service would assist the state in attempting to reduce panther road kills on local highways. Panther habitat improvement through prescribed burning would be conducted as described under the proposed action. The National Park Service would cooperate with the Florida Game and Fresh Water Fish Commission for possible reintroduction of captive-bred Florida panthers and for research, as described under the proposed action.

CULTURAL RESOURCE MANAGEMENT

Active management for cultural resources would be limited to only those sites on or nominated to the National Register of Historic Places. All other sites would be passively managed to avoid direct disturbance. Alternative A would not fulfill the intent of NPS policy, nor would it meet the requirements of existing cultural resource management laws and regulations.

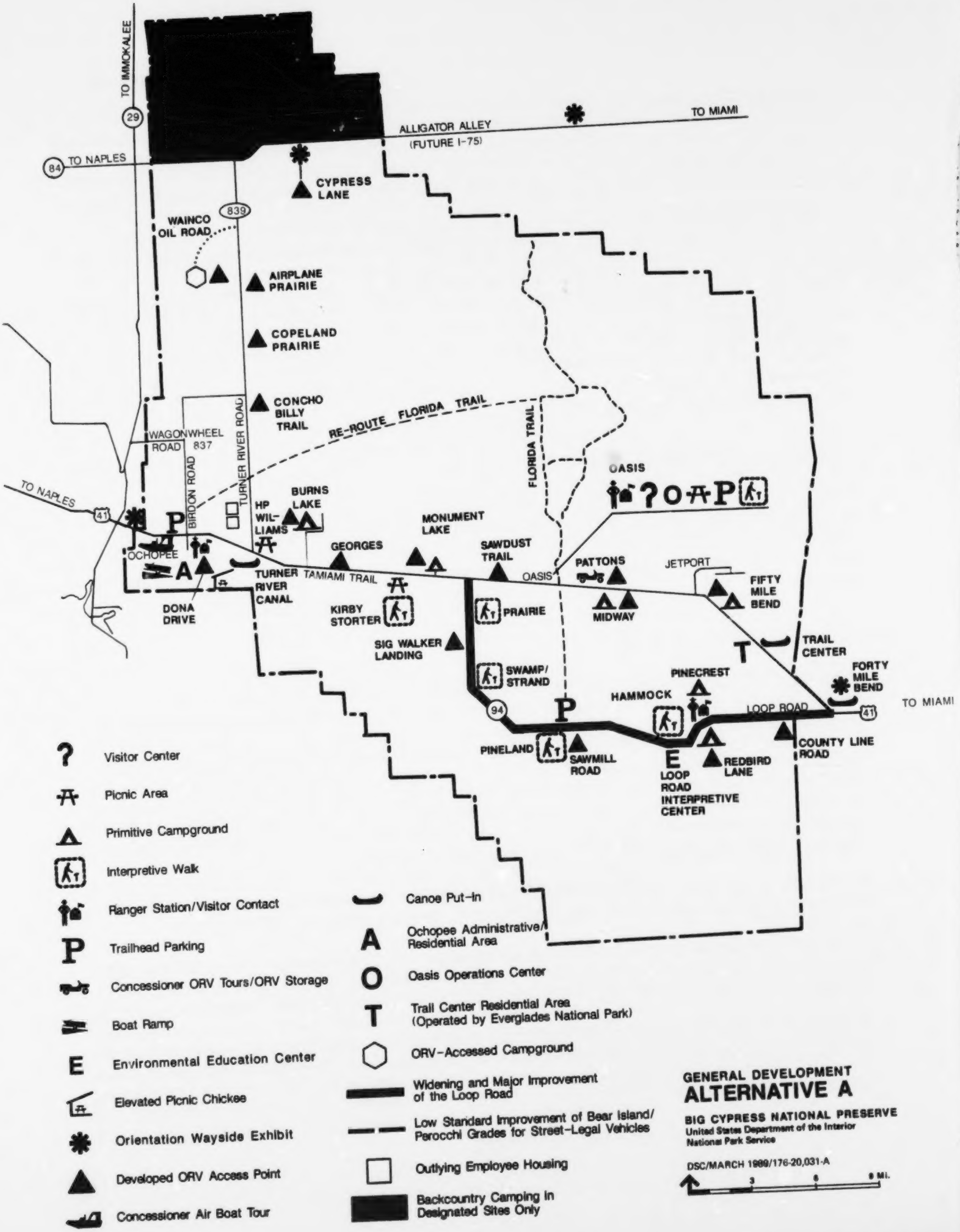
GENERAL DEVELOPMENT

General development under alternative A would be expanded, compared to the proposed action (see the Alternative A General Development map). For NPS operations the number of single-family homes at Oasis would be increased to six, and one duplex would be constructed; operational facilities would be similar to those described for the proposed action (see the Oasis Development Concept Plan map). At Ochopee all existing residential structures would remain, but no additional single-family homes would be constructed. Both Ochopee and Oasis would serve dual housing/operations functions. Selected outlying residential housing would be retained to allow better response times during emergencies and to provide an expanded NPS presence within the preserve.

A wayside information exhibit would be placed at the proposed Cypress Lane rest area (between mile-markers 31 and 32) in addition to two waysides on US 41.

The Florida National Scenic Trail would be rerouted, and the terminus would be the NPS administrative building at Ochopee rather than the Oasis visitor center. This rerouting would connect the hiking trail with the Everglades National Park Wilderness Waterway.

In addition to the six primitive campgrounds that would be provided under the proposed action, a primitive campground would also be developed at Pinecrest ranger station on the Loop Road, and one backcountry campground accessible by ORVs in the Deep Lake unit would be provided.


TO IMMOKALEE
29
84
TO NAPLES
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
CYPRESS LANE
839
WAINCO OIL ROAD
AIRPLANE PRAIRIE
COPELAND PRAIRIE
CONCHO BILLY TRAIL
RE-ROUTE FLORIDA TRAIL
WAGONWHEEL ROAD 837
BIRDON ROAD
TURNER RIVER ROAD
FLORIDA TRAIL
TO NAPLES
41
OCHOPEE
HP WIL-LIAMS
BURNS LAKE
GEORGES
MONUMENT LAKE
SAWDUST TRAIL
OASIS
PATTONS
JETPORT
FIFTY MILE BEND
DONA DRIVE
TURNER RIVER CANAL
TAMIAMI TRAIL
KIRBY STORTER
SIG WALKER LANDING
PRAIRIE
MIDWAY
TRAIL CENTER
SWAMP/ STRAND
PINECREST
HAMMOCK
FORTY MILE BEND
TO MIAMI
LOOP ROAD
41
94
PINELAND
SAWMILL ROAD
LOOP ROAD INTERPRETIVE CENTER
REDBIRD LANE
COUNTY LINE ROAD
? Visitor Center
Picnic Area
Primitive Campground
Interpretive Walk
Ranger Station/Visitor Contact
P Trailhead Parking
Concessioner ORV Tours/ORV Storage
Boat Ramp
E Environmental Education Center
Elevated Picnic Chickee
Orientation Wayside Exhibit
Developed ORV Access Point
Concessioner Air Boat Tour
Canoe Put-In
A Ochopee Administrative/ Residential Area
O Oasis Operations Center
T Trail Center Residential Area (Operated by Everglades National Park)
ORV-Accessed Campground
Widening and Major Improvement of the Loop Road
Low Standard Improvement of Bear Island/ Perocchi Grades for Street-Legal Vehicles
Outlying Employee Housing
Backcountry Camping in Designated Sites Only
0 3 6 9 MI.

GENERAL DEVELOPMENT
ALTERNATIVE A

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

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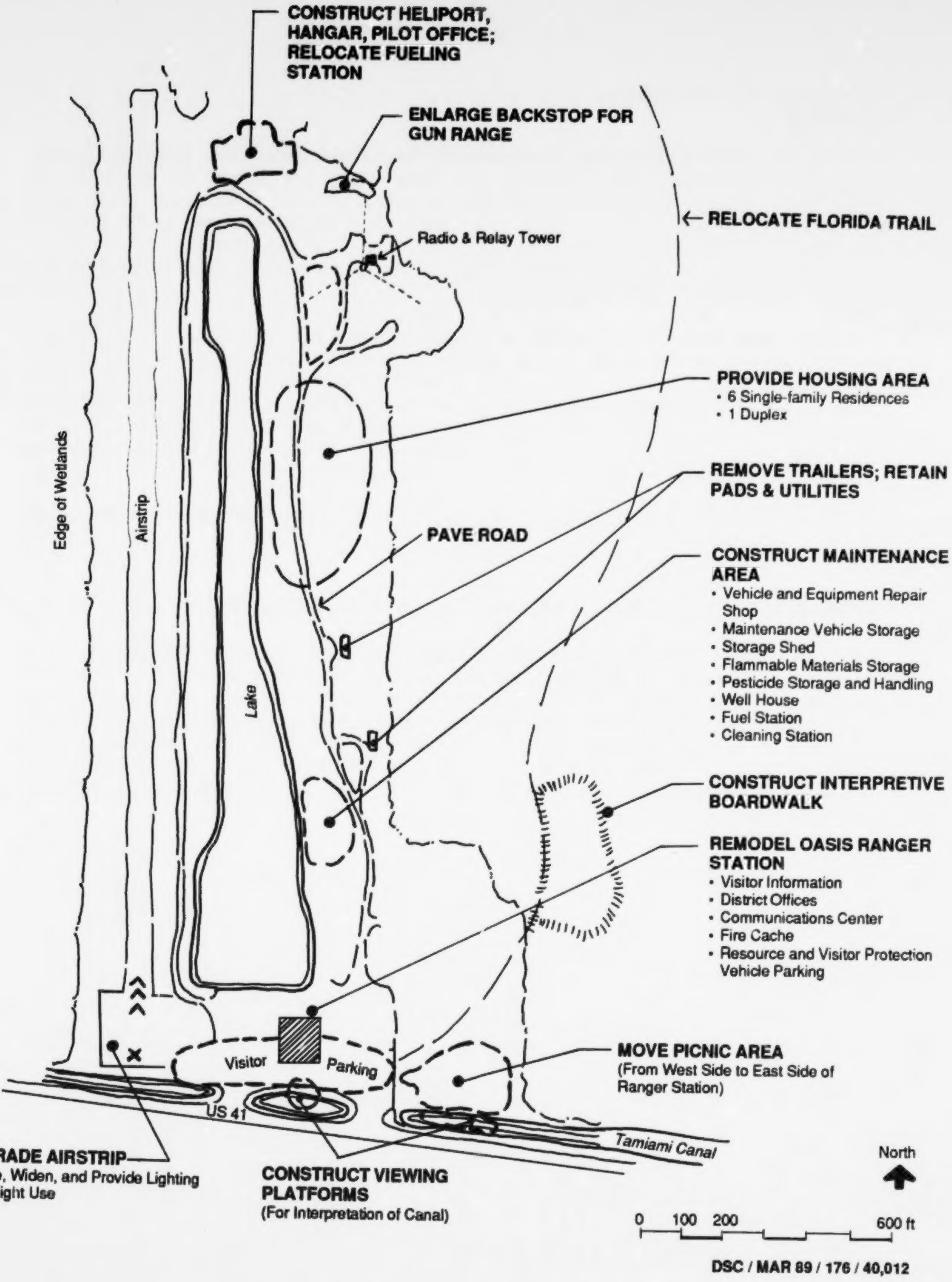

CONSTRUCT HELIPORT, HANGAR, PILOT OFFICE; RELOCATE FUELING STATION
ENLARGE BACKSTOP FOR GUN RANGE
Radio & Relay Tower
RELOCATE FLORIDA TRAIL
PROVIDE HOUSING AREA
• 6 Single-family Residences
• 1 Duplex
REMOVE TRAILERS; RETAIN PADS & UTILITIES
PAVE ROAD
CONSTRUCT MAINTENANCE AREA
• Vehicle and Equipment Repair Shop
• Maintenance Vehicle Storage
• Storage Shed
• Flammable Materials Storage
• Pesticide Storage and Handling
• Well House
• Fuel Station
• Cleaning Station
CONSTRUCT INTERPRETIVE BOARDWALK
REMODEL OASIS RANGER STATION
• Visitor Information
• District Offices
• Communications Center
• Fire Cache
• Resource and Visitor Protection Vehicle Parking
Edge of Wetlands
Airstrip
Lake
Visitor Parking
US 41
Tamiami Canal
MOVE PICNIC AREA
(From West Side to East Side of Ranger Station)
UPGRADE AIRSTRIP
• Pave, Widen, and Provide Lighting for Night Use
CONSTRUCT VIEWING PLATFORMS
(For Interpretation of Canal)
North
0
100
200
600 ft
DSC / MAR 89 / 176 / 40,012

ALTERNATIVE A

Oasis Development Concept Plan
Big Cypress National Preserve / Florida

Besides the road and access improvements described under the proposed action, Perocchi Grade / Bear Island Road in the Bear Island unit would be upgraded for street-legal vehicles. The National Park Service would encourage the state to construct an interchange at the junction of I-75 and Florida 29 to improve access to the preserve and also to the coast for visitors in the northern part of the preserve, provided that wildlife crossings and other structures would be constructed along Florida 29 to protect the Florida panther.

The Loop Road would be upgraded to provide an improved, all-season road. The bed would be raised approximately 3 feet above the ground surface (approximately 2 feet above the existing roadway), and the travel surface would be widened to 20 feet, with 2-foot shoulders. Upgrading the road would require importing roughly 270,000 cubic yards of fill material, and widening the road would require a strip of land totaling about 32 additional acres. The locations, size, and configuration of drainage structures under the road would be determined during the design phase of the project.

Protection of the visual corridors and viewsheds would be the same as described under the proposed action.

PROBABLE SCENARIO WITH IMPLEMENTATION OF ALTERNATIVE A

Table 12 lists the estimated acreages affected under an implementation scenario for alternative A. Sources for estimates are the same as described under the scenario for the proposed action. Table 13 shows the ORV management scenario, with slightly more miles of trail open to such use. The resource management scenario would be the same as described for the proposed plan. The scenario for oil and gas exploration and development would be the same as the status quo alternative except that no more than 10 percent of the preserve could be affected by oil and gas activities at any one time (see table 14).

Table 12: NPS Development Action Scenario, Alternative A

General Development	Acreage Occupied by Existing NPS Development	Acreage Occupied by Proposed NPS Development	New Acreage Disturbed (+) or Restored (–)	Cover Type Affected	Acreage of Fill Deposited (+) or Removed (–)	Cubic Yards of Fill Deposited(+) or Removed (–)
Ochopee Headquarters Area						
Big Cypress Lodge renovation Maintenance shop Equipment/vehicle storage Flammable materials storage Water plant Housing – 9 existing units Utilities – existing electricity, existing waterlines, new sewage lines (3,500 lin ft), rehabilitated percolation pond, and reclaimed percolation pond Parking	97	96	–1.0	Disturbed land (fill)	–1.0	–9,700
Associated actions – retain 5 existing outlying houses, 5 other existing houses; remove 4 trailer pads	4	1.5	–2.5	Disturbed land (fill)	–0.5	–4,800
Oasis Visitor Center/Operations Center						
Picnic area Boardwalks (3) Oasis ranger station rehabilitation Landing strip Helicopter hangar Maintenance shop Vehicle storage Materials storage Flammable materials storage Pesticide storage Vehicle and equipment cleaning facility Well house Housing (8 units)	44	44	0	Disturbed land (fill)	0	0
Associated actions – retain 4 existing residences; 4 existing residences; remove 4 existing residences	3	1.5	–1.5	Disturbed land (fill)	–1.0	–4,800

General Development	Acreage Occupied by Existing NPS Development	Acreage Occupied by Proposed NPS Development	New Acreage Disturbed (+) or Restored (–)	Cover Type Affected	Acreage of Fill Deposited (+) or Removed (–)	Cubic Yards of Fill Deposited (+) or Removed (–)
Concessions						
Ochopee	0	0.5	0	Disturbed land (fill)	0	0
Pattons	0	19.0	0	Disturbed land (fill)	0	0
ORV Access Points						
Dona Drive	0	0.5	0	Disturbed land (fill)	0	0
Burns Lake	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Georges	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Monument Lake	0	0.5	+0.5	Melaleuca and prairie	+0.5	+2,500
Sawdust Trail	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Pattons	0	0.5	0	Disturbed area (fill)	0	0
Fifty Mile Bend	0	0.5	+0.5	Cypress prairie	0	0
Airplane Prairie	0	0.5	+0.5	Prairie	+0.5	+2,500
Copeland Prairie	0	0.5	+0.5	Disturbed land and prairie	+0.5	+2,500
Concho Billy Trail	0	0.5	+0.5	Prairie	+0.5	+2,500
Cypress Lane (access road and staging area)	0	15.0	+11.5	Disturbed area, cypress prairie, second-growth pinelands	+5.0	+48,500
Perocchi Grade	0	0.5	+0.5	Second-growth pinelands	0	0
Sig Walker Landing	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Sawmill Road	0	0.5	+0.5	Cypress prairie/second-growth pineland	+0.5	+2,500
Pinecrest	0	0.5	0	Disturbed land (fill)	0	0
County Line Trail	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Undeveloped ORV Access Points						
Trail Center	0.3	0.3	0	Disturbed land (fill)	0	0
Fifty Mile Bend	0.3	0.3	0	Disturbed land (fill)	0	0
Orientation Wayside Exhibits						
West Entrance	0	0.3	+0.3	Marsh* and canal	+0.3	+3,000
East Entrance	0	0.3	0	Disturbed land (fill)	0	0
Cypress Lane	(see ORV Access Points)		–	–	–	–
Canoe Put-ins and Parking						
Turner River Canal	0	0.75	+0.75	Second-growth pinelands	+0.5	+4,800
Trail Center	0	0.3	+0.3	Disturbed land (fill)	0	0
Forty Mile Bend	0	0.3	0	Disturbed land (fill)	0	0
Boat Ramp						
Seagrape Drive (Ochopee)	0.3	0.3	0	Disturbed land (fill)	0	0
Campgrounds						
Burns Lake	14.0	14.3	+0.3	Disturbed land (fill) and cypress prairie	+0.3	+3,000
Monument Lake	17.0	17.3	+0.3	Disturbed land (fill) and prairie	+0.3	+3,000
Midway	9.0	9.0	0	Disturbed land (fill)	0	0
Fifty Mile Bend	11.0	11.3	+0.3	Disturbed land (fill) and cypress prairie	+0.3	+3,000
Red Bird Lane	0	2.5	+1.0	Disturbed land and hardwood hammock*	0	0
Bear Island	5.5	6.0	+0.5	Disturbed land and second-growth pinelands	0	0
Cypress Lane	(see ORV Access Points)		–	–	–	–

General Development	Acreage Occupied by Existing NPS Development	Acreage Occupied by Proposed NPS Development	New Acreage Disturbed (+) or Restored (–)	Cover Type Affected	Acreage of Fill Deposited (+) or Removed (–)	Cubic Yards of Fill Deposited (+) or Removed (–)
Interpretive Trails						
Kirby Storter extension	0	0.1	+0.1	Cypress strand/mixed-hardwood swamp*	0	0
East Hinson Marsh						
Parking	0	0.3	0	Disturbed land (fill)	0	0
Trail	0	0.75	+0.75	Cypress strand/mixed-hardwood swamp,* hardwood hammock,* marsh*	0	0
Loop Road – Prairie						
Parking	0	0.3	+0.3	Canal and prairie	+0.3	+3,000
Trail	0	0.5	+0.5	Prairie and cypress prairie	0	0
Loop Road – Cypress strand/mixed-hardwood swamp						
Parking	0	0.3	+0.3	Canal and cypress strand/ mixed hardwood swamp*	+0.3	+3,000
Trail	0	0.5	+0.5	Cypress strand/mixed-hardwood swamp*	0	0
Loop Road – Pinelands						
Parking	0	0.3	+0.3	Second-growth pinelands and cypress prairie	+0.3 0	+3,000 0
Trail	0	0.5	+0.5	Second-growth pinelands	0	0
Loop Road – Hardwood hammock						
Parking	0	0.3	0	Disturbed land	0	0
Trail	0	0.3	0	Hardwood hammock* (previously disturbed)	0	0
Loop Road Trailhead Parking	0	0.3	+0.3	Cypress prairie	+0.3	+1,500
Pinecrest Ranger Station/Maintenance Substation	0	3.0	0	Disturbed land	0	0
Bear Island Ranger Station	0	0.3	0	Disturbed land	0	0
Loop Road Interpretive Center	6.0	6.0	0	Disturbed land	0	0
Loop Road Improvements	55.0	87.0	+32.0	Hardwood hammock*/old-growth pineland*/cypress strand/ mixed-hardwood swamp*/ cypress prairie, prairie, disturbed land	+32.0	+268,600
Bear Island Road/Perrochi Grade Improvement	0	14.2	+5.2	Disturbed land (partial fill) hardwood hammock, marsh, cypress strand/mixed-hardwood swamp, second-growth pinelands	+5.2	+23,000
Total	**266.4**	**363.2**	**+52.3** net new disturbance**		**+47.5**	**+373,100 cu yds**

---

* Important resource area.

**5.0 acres of restored land and 57.3 acres of new disturbance; 39.5 acres already disturbed.

Table 13: ORV Management Scenario, Alternative A

Management Unit	Existing Trail		Proposed Trail		Restored Trail	
	Miles	Acres	Miles	Acres	Miles	Acres
Bear Island	90	160	70	125	20	35
Deep Lake	120	215	100	180	20	35
Turner River	410	740	380	685	30	55
Corn Dance	120	215	100	180	20	35
Loop	0	0	30	54	-30	-54
Stairsteps	500	900	440	780	60	120
Total	1,240	2,230	1,120	2,004	120	226

Table 14: Oil and Gas Development Scenario, Alternative A

Units Potentially Affected by Surface Disturbance:	All
Number of Additional Fields:	3
Number of Wells:	
Wildcats (dry)	20
Discovery wells	3
Wells needed to develop fields	31
Field delineation wells	6
Total	60
Number of Megapads:	6
Miles of Additional Access Road and Pipeline:	40
Disturbed Acreage:	
Pads, roads, pipelines	
Existing	259
Potential	215
Total	474
Geophysical survey lines	
Existing	858
Potential	524
Total	1,382
Total Area of Oil and Gas Influence (percentage of preserve):	
Existing	38,458 (6.7)
Potential	38,036 (6.6)
Total	76,494 (13.3)*

---

* Even though this level of development is projected, as in the status quo alternative, exploration and development activities would not be permitted to affect more than 10 percent of the preserve at any one time.

ALTERNATIVE B

Alternative B would provide some limited recreational opportunities, but the management emphasis would be the preservation of both natural and cultural resources. The interpretive program would convey the purpose and significance of the preserve, but minimal facilities would be provided for on-site experiences.

VISITOR USE

Alternative B would provide minimum interpretive and recreational opportunities and limited services.

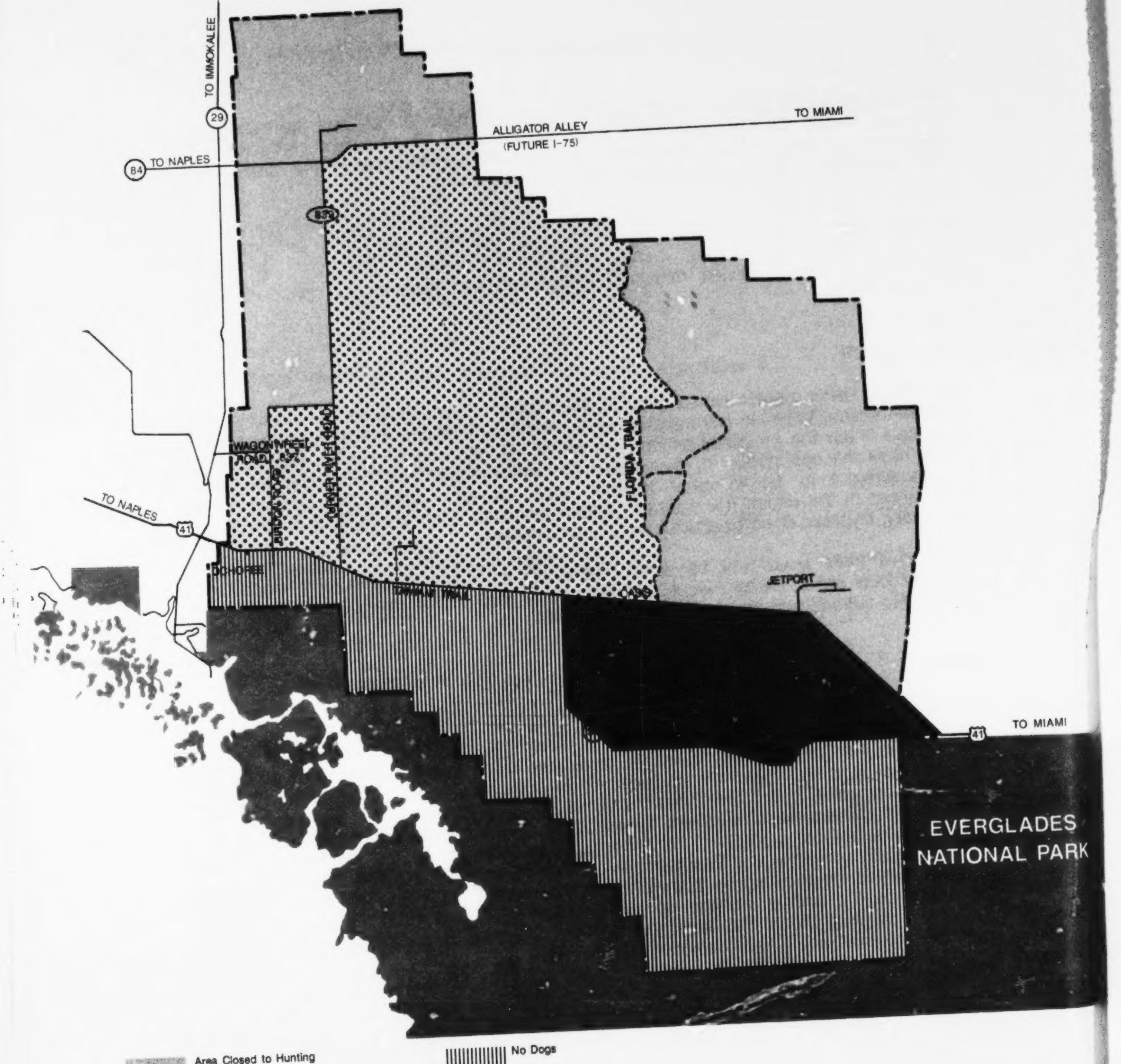
Interpretation

The Oasis visitor center would provide the same opportunities as described for the proposed action. Wayside orientation exhibits would be provided at the same locations as described under the proposed action (two on US 41 and one on Florida 84). All visitors would have the opportunity to learn about the preserve and its purpose, but they would be encouraged to go to other federal, state, or local areas that offered on-site experiences in the region (for example, Collier Seminole State Park, Cork Screw Swamp Sanctuary, Cypress Bend boardwalk, and Shark Valley).

Interpretive trails would not be developed along the Loop Road, which would serve primarily local traffic. Visitors would still be able to stop at the two roadside parks along US 41. No outreach program would be developed.

Hunting

The general gun season under alternative B would be limited to 30 days, and a full-season quota permit system for hunters would be initiated. Hunting would only be permitted in the Turner River, Stairsteps, and Loop units. In the Loop unit only bow and blackpowder hunting would be allowed. All hunting would be prohibited in the Bear Island, Deep Lake, and Corn Dance units to improve protection for the panther. Bird dogs would be allowed only in the Turner River and Stairsteps units; all other hunting with dogs would be prohibited. To encourage an increase in the panther prey base throughout the preserve, the total number of white-tailed deer and hogs harvested by all methods would be reduced by approximately 75 percent per year. The reduction would be based on the annual average harvest between 1980 and 1986. Opportunities using ORVs for hunting would still be provided, but they would be more restricted under alternative B than any other alternative.


TO IMMOKALEE
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TO MIAMI
ALLIGATOR ALLEY
(FUTURE I-75)
84
TO NAPLES
839
WAGONWHEEL ROAD
837
BIRDON ROAD
TURNER RIVER ROAD
FLORIDA TRAIL
TO NAPLES
41
OCHOPEE
TAMIAMI TRAIL
JETPORT
41
TO MIAMI
EVERGLADES
NATIONAL PARK

▒ Area Closed to Hunting

▦ No Dogs

░ 30-Day General Gun Season; No More Than 140 Days Per Year Open to Hunting

■ Bow and Muzzle-Loading Gun Hunting Only

⁘ Bird Dogs Only

NOTE: Numbers of Hunters for All Seasons Would Be Controlled by a Full-Season Quota System

HUNTING MANAGEMENT
ALTERNATIVE B

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176-20,029-A

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ORV Use

ORV use would be greatly curtailed under alternative B as compared to current management (see ORV Use map). ORVs would continue to be prohibited in the Loop unit. The Bear Island, Deep Lake, and Corn Dance units would also be closed to maximize protection of known panther areas. Exceptions would be made for exempt inholding owners so that they could get to their properties by way of specified trails.

ORV use would be restricted to a skeletal network of designated trails in the Turner River and Stairsteps units. In the Stairsteps unit only airboats would be allowed east and south of Gator Hook Strand. ORV access to the units would be limited to 13 improved parking/staging areas (up to 20-car/trailer sites each) and two unimproved access points (see ORV Use map).

An annual ORV permit would be required to operate in the preserve. No more than 1,500 permits per year would be issued for ORVs; tracked vehicles and buggies with V-type tractor tires would be prohibited. Other existing regulations at 36 CFR 1.5 would continue to be enforced.

Other Recreational Activities

Four primitive campgrounds (Red Bird Lane, Monument Lake, Burns Lake, and Bear Island) would be developed for local users and tourists (see General Development map). No facilities for canoeing would be provided within the preserve. Picnicking would be available at Oasis and the two existing roadside parks on US 41.

No concession services would be provided.

The Florida National Scenic Trail would be rerouted to terminate at the east side of the Oasis visitor center, as described under the proposed action.

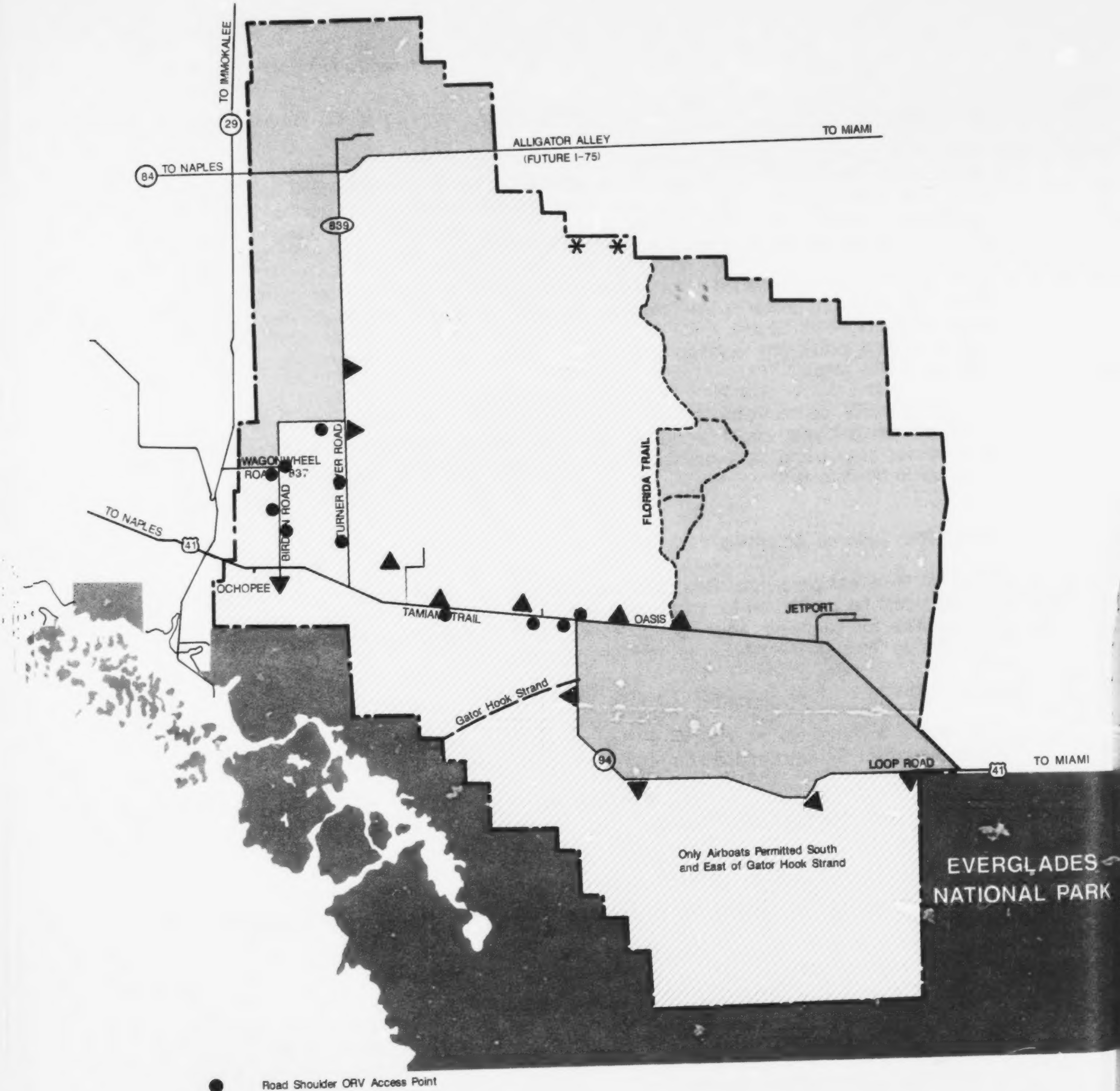
NATURAL RESOURCE MANAGEMENT

Hydrology

Hydrological management would be the same as described under the proposed action.

Minerals

Under alternative B oil and gas development would continue on a limited basis. Important resources would be avoided and protected at all costs. NPS regulations at 36 CFR 96 would apply where developments were allowed, and a minerals management plan would be implemented to guide development.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ROAD 837
BIRDON ROAD
TURNER RIVER ROAD
FLORIDA TRAIL
TO NAPLES
41
OCHOPEE
TAMIAMI TRAIL
OASIS
JETPORT
Gator Hook Strand
94
LOOP ROAD
41
TO MIAMI
Only Airboats Permitted South and East of Gator Hook Strand
EVERGLADES NATIONAL PARK

● Road Shoulder ORV Access Point

* Boundary Entry Point

▲ Developed ORV Access Point

▨ Designated Trails Only

■ Closed to ORV Use

ORV MANAGEMENT

ALTERNATIVE B

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,033-A

0 3 6 9 MI.

Oil and gas development would be managed as described below (see Minerals Management map):

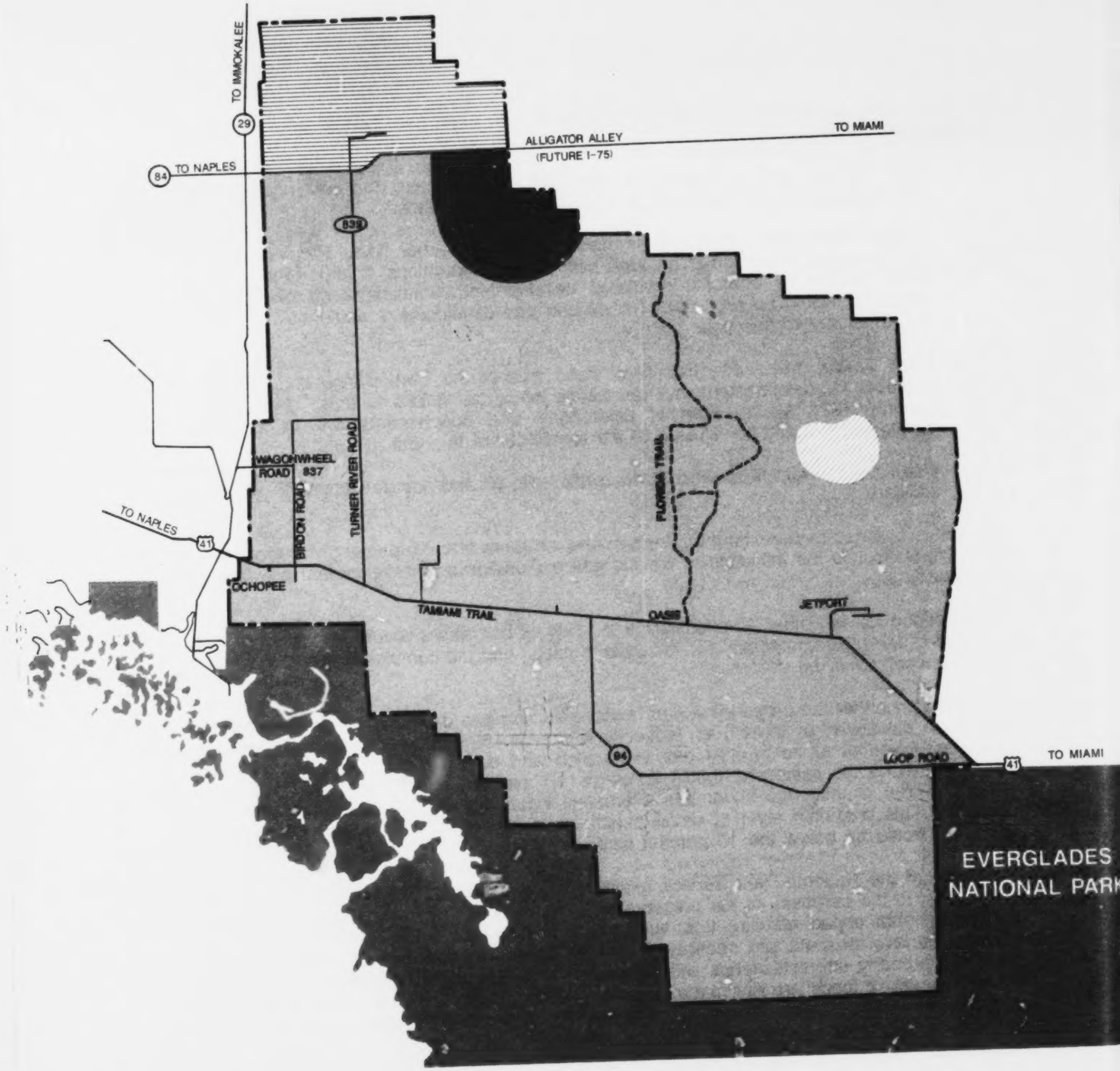
> **Bear Island unit** – Future oil and gas development, including geophysical operations, would be restricted to existing roads and pads.
>
> **Turner River unit** – Only the northern part of the Turner River unit, which is on the Sunniland trend and is an area with low concentrations of important resource areas, would be open to regulated development. Concentrations of important resources would be protected. No oil and gas development would be allowed in the remainder of this unit.
>
> **Corn Dance unit** – The Sunniland trend area of the Corn Dance unit would be available for development, but operations would be limited to those described in Exxon's 1981 *Master Plan of Operations*, and supplements. No oil and gas development would be allowed in the remainder of this unit.
>
> **Deep Lake, Stairsteps, and Loop units** – No oil and gas development would be allowed.

In addition to these management unit restrictions, no more than 10 percent of the preserve could be subject to the influence of oil and gas exploration and development activities at any one time.

As described for the other alternatives, new plans of operations would be reviewed and modified to minimize immediate and localized impacts, and the cumulative impacts of each new proposal would be analyzed.

As described under the proposed action, existing oil and gas development in the preserve has been calculated to directly or indirectly affect 38,458 acres or 6.7 percent of the preserve. Potential future oil and gas exploration and development under alternative B would influence an estimated 6,357 acres or 1.1 percent of the preserve. The total expected area of influence under this alternative would be 44,815 acres, or 7.8 of the preserve. This projected level of development could be allowed since the total area of influence would be below the 10 percent limit.

In the event the National Park Service rejects a plan of operations because it would be detrimental to the purposes of the preserve or because of anticipated unacceptable levels of environmental impact resulting from such operations (i.e., the existing regulations cannot provide the level of protection necessary) and the denial is viewed as a potential for the taking of property interests, funds will be sought from Congress to acquire the affected mineral estate. If funds are not made available for acquisition within a reasonable period of time, the oil and gas operation will be allowed to proceed under reasonable rules and regulations.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TAMIAMI TRAIL
OASIS
JETPORT
94
LOOP ROAD
41
TO MIAMI
EVERGLADES
NATIONAL PARK

■ Regulated Exploration and Development; Important Resource Areas Protected

▨ Expansion of Raccoon Point Field Limited to Level Presented in Exxon's 1981 *Master Plan of Operations;* Important Resource Areas Protected

☰ Exploratory Drilling and Production Restricted to Previously Disturbed Areas

▒ No Surface Activity Allowed

MINERALS MANAGEMENT

ALTERNATIVE B

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176-20,034-A

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Vegetation

Protected plant species (see tables 20 and 21 in the "Affected Environment") would be expected to benefit from actions to maintain natural water regimes, allow prescribed burning and managed wildfires, and control exotic species. Control programs for exotic plants would be the same as those described for the proposed action.

Fire Management

Management of prescribed burning and prescribed natural fires, and the suppression of wildfires, would be the same as described for the proposed action.

Wildlife

As described under the proposed plan, most of the protected species in Big Cypress (see tables 22 and 23 in the "Affected Environment") would benefit from actions to maintain natural water regimes, allow prescribed burning, control exotic plants, and protect species from unlawful collection. Management actions for the Cape Sable seaside sparrow and the red-cockaded woodpecker would be the same as those described for the proposed action. The Florida panther and *Liguus* tree snails would receive additional protection through the management actions described below.

Florida Panther. Hunting of white-tailed deer, hogs, and other wildlife that panthers may prey upon would be prohibited in the Bear Island, Deep Lake, and Corn Dance units. Hunting dogs other than bird dogs would be excluded from the preserve, and bird dogs would only be allowed in the Turner River and Stairsteps units. For the Stairsteps and Turner River units a full-season quota on numbers of hunters and a 30-day hunting season would be initiated to further protect panthers from any potential adverse impacts. Preservewide there would be a reduction of approximately 75 percent in the total deer and hog harvests.

To reduce potential disturbance to Florida panther habitat, ORV use would be prohibited in the Bear Island, Deep Lake, Corn Dance, and Loop units; ORV use in the remaining units would be restricted to designated trails. As described above, oil and gas activity would be greatly restricted.

Prescribed burning would be used to improve deer browse for panther habitat, as described under the proposed action.

Research efforts would concentrate on the distribution of panther sign, studies of fecal content, and other methods that would not result in physical disturbance of panthers. The National Park Service would cooperate with the Florida Game and Fresh Water Fish Commission to reintroduce captive-bred Florida panthers into the preserve and for panther research.

***Liguus* Tree Snails.** Under this alternative the collecting of tree snails, except for valid scientific investigations, would be prohibited in the preserve. Snail habitat on hardwood hammocks would continue to be protected from fire. All exotic animals, including snail predators, would be controlled or eliminated.

White-tailed Deer and Feral Hogs. Under this alternative feral hogs would be considered an undesirable exotic species, and programs would be undertaken to eradicate them. If eradication was impossible, then a systematic reduction program would be established. Recreational hunting for hogs in the Turner River and Stairsteps units would be managed for hog reduction.

White-tailed deer hunting would be restricted to the Turner River, Loop, and Stairsteps units (see "Hunting"). Unlike the proposed action, no habitat management programs would be specifically designed to benefit deer, but deer would benefit incidentally from prescribed burns and the restoration of natural fire regimes.

Monitoring of deer and hog populations would be improved by conducting more thorough checks of harvested game and periodic systematic surveys. Improved monitoring would be facilitated by the reduced hunting program. Research into the effects of hunting on white-tailed deer would be conducted by comparing conditions in hunted units with those in unhunted units. Unlike the proposed action, the Bear Island, Deep Lake, and Corn Dance units would be permanently closed to hunting.

Exotic Species. To the extent practicable, all exotic animals would be reduced or eliminated. Highest priority for elimination would be feral hogs and armadillos.

CULTURAL RESOURCE MANAGEMENT

The National Park Service would actively protect all sites on or eligible for listing on the National Register of Historic Places. A research program would be established to determine eligibility and to determine methods for protecting sites from damage by animals, exotic vegetation, or human use. Selected sites would be systematically excavated to gather data for a more complete understanding of the regional archeology.

Sites not of National Register significance would also be protected. NPS personnel would patrol known archeological and historic sites to discourage vandalism and to monitor effects of animal use or other natural processes.

Signs would be posted at visitor contact areas to inform the public of laws and associated penalties for vandalism of archeological sites or disturbance to human remains on federal lands. Other media techniques would also be used to further educate the public about the significance and fragility of cultural resources.

In accordance with the Archeological Resources Protection Act of 1979 and chapter 872, Florida Statutes 1987, the National Park Service would strictly enforce penalties for disturbing human remains.

GENERAL DEVELOPMENT

Oasis would be developed as the primary interpretive center in the preserve, and the only on-site visitor opportunities would be at Kirby Storter Roadside Park.

All functions and facilities now at Ochopee would be transferred to Oasis, which would become the administrative, maintenance, operations, and housing center for the preserve (see the Oasis Development Concept Plan map for this alternative). Approximately seven new single-family homes, seven townhouse units, and 30 multifamily housing units would be constructed to replace housing at Ochopee. Fill would be required to accommodate housing, storage, and maintenance facilities at Oasis, and a new utility system would be required. The airstrip would be upgraded, and new hangar facilities would be constructed at the north end of the runway.

With the removal of NPS facilities at Ochopee, abandoned fill areas would be restored to original contours. All outlying housing would be removed, and the area would be reclaimed. These actions would remove all NPS administrative, maintenance, and residential facilities from the 100- and 500-year floodplains.

Under alternative B fewer facilities would be provided for visitors to enjoy the preserve than under the proposed action or alternative A. A picnic area would be provided at the Oasis visitor center, as described under the proposed action, in addition to the two existing roadside parks on US 41. Three general interest orientation waysides would be installed (two on US 41 and one on Florida 84).

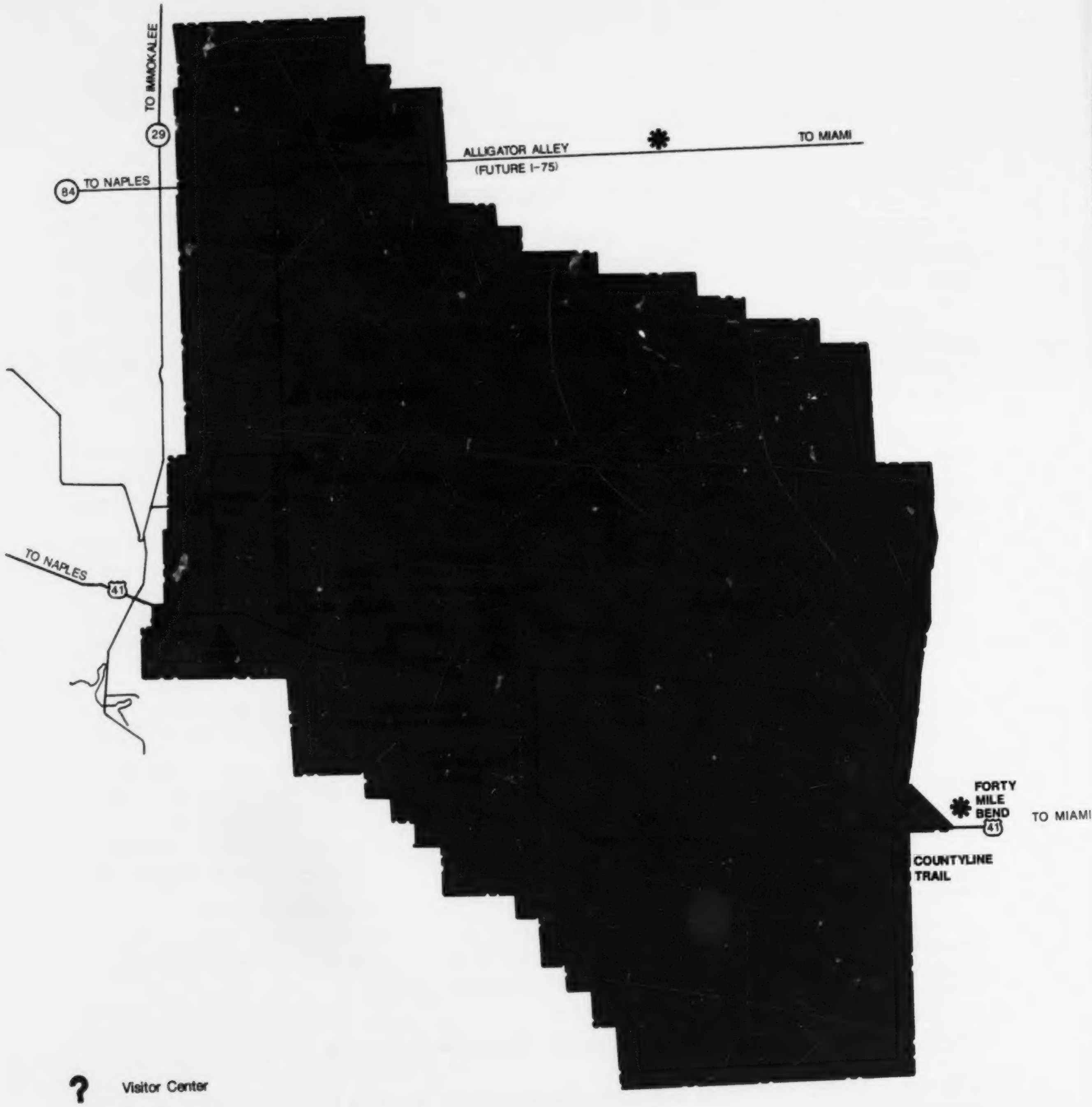
Interpretive trails would not be developed along the Loop Road. The location of the trailhead for the Florida National Scenic Trail would be changed to the east side of the Oasis visitor center, as described in the proposed action.

Four primitive campgrounds (Bear Island, Burns Lake, Monument Lake, and Red Bird Lane) would be provided to accommodate local users and tourists. Campsites would be designated, and self-contained toilets, picnic tables, grills, and trash receptacles would be provided. A central sewage dump facility for trailers and recreation vehicles would be provided at Ochopee.

The Loop Road would be upgraded as described under the proposed action. Thirteen ORV access/staging areas would be developed. The protection of visual corridors and viewsheds would be the same as that described for the proposed action.

PROBABLE SCENARIO WITH IMPLEMENTATION OF ALTERNATIVE B

Table 15 lists the estimated acreages affected under an implementation scenario for alternative B. Sources of estimates are the same as described under the proposed action. Table 16 gives the ORV management scenario. Resource management scenarios (hydrological management, exotic plant control, and fire management) would be the same as for the proposed action. Table 17 shows the oil and gas development scenario under this alternative, which projects the development of one average-sized field and approximately 17 miles (21 acres) of geophysical survey lines.


TO IMMOKALEE
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(FUTURE I-75)
TO MIAMI
84
TO NAPLES
TO NAPLES
41
FORTY MILE BEND
41
TO MIAMI
COUNTYLINE TRAIL

?	Visitor Center
	Picnic Area
△	Primitive Campground
	Interpretive Walk
	Ranger Station/Visitor Contact
P	Trailhead Parking
A	Administrative/Residential Area
E	Environmental Education Center
✱	Orientation Wayside Exhibit
▲	Developed ORV Access Point
O	Oasis Operations Center/ Administrative Center/Residential Area
T	Trail Center Residential Area (Operated by Everglades National Park)
— —	Resurface Loop Road and Improve Hydrological Flow
▬	Backcountry Camping at Designated Sites Only

GENERAL DEVELOPMENT
ALTERNATIVE B

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

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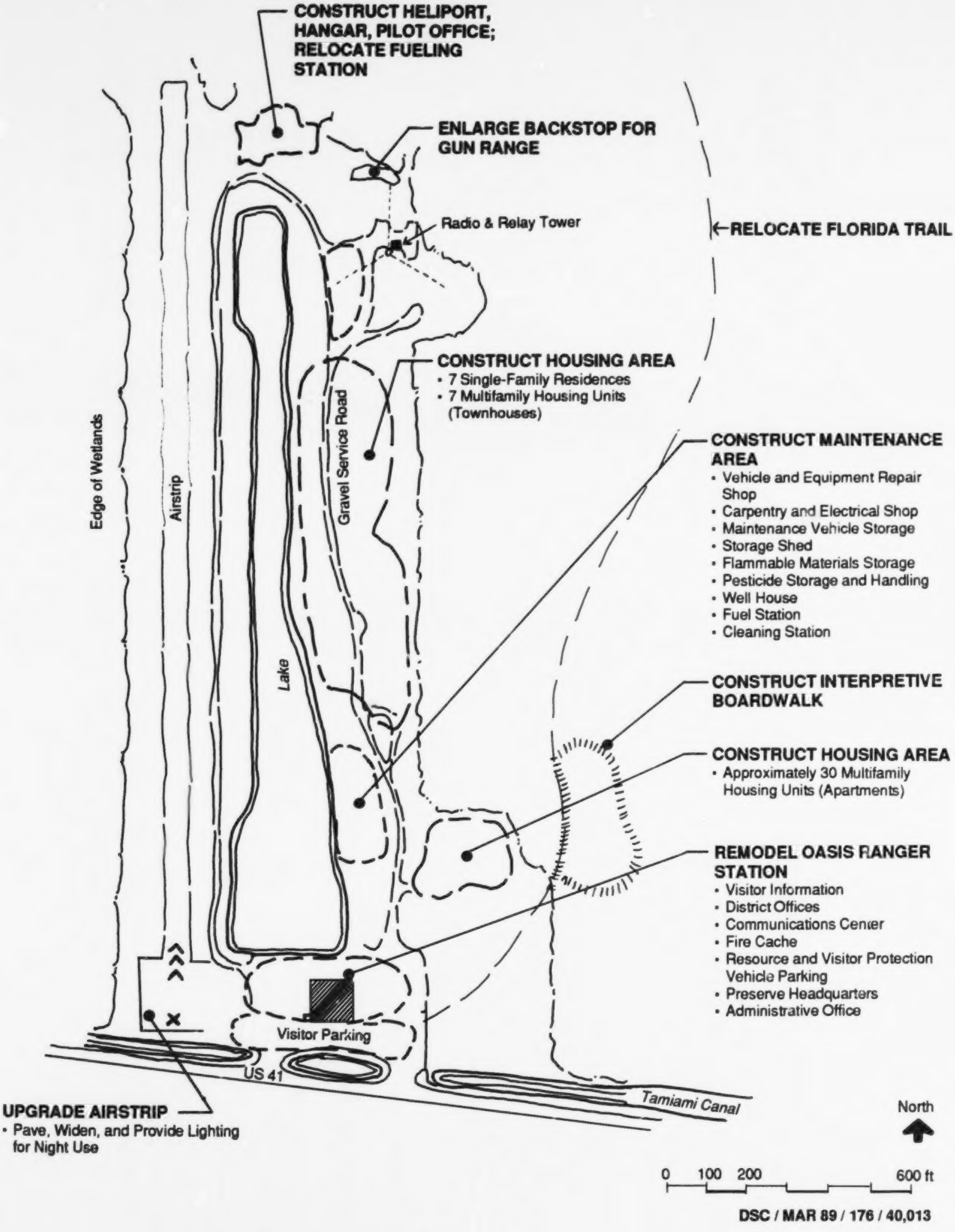

Radio & Relay Tower
Edge of Wetlands
Airstrip
Lake
Gravel Service Road
Visitor Parking
US 41
Tamiami Canal
North
0
100
200
600 ft

CONSTRUCT HELIPORT, HANGAR, PILOT OFFICE; RELOCATE FUELING STATION

ENLARGE BACKSTOP FOR GUN RANGE

RELOCATE FLORIDA TRAIL

CONSTRUCT HOUSING AREA
- 7 Single-Family Residences
- 7 Multifamily Housing Units (Townhouses)

CONSTRUCT MAINTENANCE AREA
- Vehicle and Equipment Repair Shop
- Carpentry and Electrical Shop
- Maintenance Vehicle Storage
- Storage Shed
- Flammable Materials Storage
- Pesticide Storage and Handling
- Well House
- Fuel Station
- Cleaning Station

CONSTRUCT INTERPRETIVE BOARDWALK

CONSTRUCT HOUSING AREA
- Approximately 30 Multifamily Housing Units (Apartments)

REMODEL OASIS RANGER STATION
- Visitor Information
- District Offices
- Communications Center
- Fire Cache
- Resource and Visitor Protection Vehicle Parking
- Preserve Headquarters
- Administrative Office

UPGRADE AIRSTRIP
- Pave, Widen, and Provide Lighting for Night Use

DSC / MAR 89 / 176 / 40,013

ALTERNATIVE B

Oasis Development Concept Plan
Big Cypress National Preserve / Florida

Table 15: NPS Development Action Scenario, Alternative B

General Development	Acreage Occupied by Existing NPS Development	Acreage Occupied by Proposed NPS Development	New Acreage Disturbed (+) or Restored (–)	Cover Type Affected	Acreage of Fill Deposited (+) or Removed (–)	Cubic Yards of Fill Deposited (+) or Removed (–)
Ochopee Headquarters Area						
Remove all NPS facilities and restore site to original contours	97.0	0	–97.0	Disturbed land (fill)	–97.0	-940,900
Associated action – remove 10 houses and 4 trailer pads	4.0	0	–4.0	Disturbed land (fill)	–1.0	–9,700
Oasis Visitor Center/Operations Center						
Boardwalk (1) Oasis ranger station rehabilitation Landing strip Helicopter hangar Vehicle and equipment repair shop Carpentry and electrical shop Maintenance vehicle storage Covered materials storage Pesticide storage Flammable materials storage Fuel station Cleaning station Well house Housing – 7 single-family residences, 7 townhouse units, and 30 multifamily units	44.0	45.0	+1.0	Disturbed land (fill) and cypress prairie	+1.0	+9,700
Associated action – remove 8 outlying existing residences	3.0	0	-3.0	Disturbed land (fill)	–1.0	–4,800

General Development	Acreage Occupied by Existing NPS Development	Acreage Occupied by Proposed NPS Development	New Acreage Disturbed (+) or Restored (–)	Cover Type Affected	Acreage of Fill Deposited (+) or Removed (–)	Cubic Yards of Fill Deposited (+) or Removed (–)
ORV Access Points						
Dona Drive	0	0.5	0	Disturbed land (fill)	0	0
Burns Lake	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Georges	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Monument Lake	0	0.5	+0.5	Melaleuca and prairie	+0.5	+2,500
Concho Billy Trail	0	0.5	+0.5	Prairie	+0.5	+2,500
Airplane Prairie	0	0.5	+0.5	Prairie	+0.5	+2,500
Sig Walker Landing	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Pinecrest	0	0.5	0	Disturbed land	0	0
County Line Trail	0	0.5	+0.5	Cypress prairie	+0.5	+2,500
Orientation Wayside Exhibits						
West Entrance	0	0.3	+0.3	Marsh* and canal	+0.3	+3,000
East Entrance	0	0.3	0	Disturbed land (fill)	0	0
Campgrounds						
Burns Lake	14.0	14.3	+0.3	Disturbed land (fill) and cypress prairie	+0.3	+3,000
Monument Lake	17.0	17.3	+0.3	Disturbed land (fill) and prairie	+0.3	+3,000
Red Bird Lane	0	2.5	+1.0	Disturbed land and hardwood hammock*	0	0
Bear Island	5.5	6.0	+0.5	Disturbed land and second-growth pinelands	0	0
Interpretive Trails						
East Hinson Marsh						
Parking	0	0.3	0	Disturbed land (fill)	0	0
Trail	0	0.75	+0.75	Cypress strand/mixed-hardwood swamp,* hardwood hammock,* marsh*	0	0
Loop Road Trailhead Parking	0	0.3	+0.3	Cypress prairie	+0.3	+1,500
Loop Road Interpretive Center	6.0	6.0	0	Disturbed land	0	0
Loop Road Improvements	55.0	55.0	0	(no further disturbance outside existing road prism)	0	0
Total	**245.5**	**152.55**	**-96.05** net restored area**		**-93.3**	**-917,700**

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* Important resource area.
**104 acres restored and 7.95 acres of new disturbance; 3.1 acres already disturbed.

Table 16: ORV Management Scenario, Alternative B

Management Unit	Existing Trails Miles	Existing Trails Acres	Proposed Trail Miles	Proposed Trail Acres	Restored Trail Miles	Restored Trail Acres
Bear Island	90	160	0	0	90	160
Deep Lake	120	215	0	0	120	215
Turner River	410	740	380	685	30	55
Corn Dance	120	215	0	0	120	215
Loop	0	0	0	0	0	0
Stairsteps	500	900	440	780	60	120
Total	1,240	2,230	820	1,465	420	765

Table 17: Oil and Gas Development Scenario, Alternative B

Units Potentially Affected by Surface Disturbance:	Turner River, Corn Dance
Number of Additional Fields:	1
Number of Wells	
Wildcats (dry)	5
Discovery wells	1
Wells needed to develop fields	3
Field delineation wells	1
Total	10
Number of Megapads:	1
Miles of Additional Access Road:	8
Disturbed Acreage:	
Pads, roads, pipelines	
Existing	259
Potential	39
Total	298
Geophysical survey lines	
Existing	858
Potential	21
Total	879
Total Area of Oil and Gas Influence (percentage of preserve):	
Existing	38,458 (6.7)
Potential	6,357 (1.1)
Total	44,815 (7.8)

Table 18: Summary of Proposed Action and Alternatives

Visitor Use	Proposed Action	Status Quo Alternative	Alternative A	Alternative B
Interpretation	Expand interpretive program to reach broader spectrum of the general public.	Minimal interpretation.	Same as proposed action.	Modestly expand interpretive program; encourage visitors to see other interpretive sites outside the preserve.
	Focus interpretive programs at Oasis.	Same as proposed action.	Same as proposed action.	Same as proposed action.
	Provide three orientation wayside exhibits.	No orientation wayside exhibits.	Provide four orientation wayside exhibits.	Same as proposed action.
	Provide six self-guiding interpretive walks.	No interpretive walks.	Same as proposed action; provide interpretive wayside exhibits on Perocchi Grade/ Bear Island Road.	No interpretive walks.
	Maintain the Loop Road interpretive center.	Same as proposed action.	Same as proposed action.	Same as proposed action.
Hunting	Establish a 40-day general gun season, with full-season quota permits, in the Bear Island, Turner River, Corn Dance, Loop, and Stairsteps units. Allow only bow hunting in the Deep Lake unit.	Continue a 60-day general gun season, with first 9-day quota permits, in all units.	Establish a 40-day general gun season, with full-season quota permits, in all units.	Establish a 30-day general gun season, with full-season quota permits, in the Turner River and Stairsteps units. Allow only bows and muzzle-loaded firearms in the Loop unit. Prohibit all hunting in the Bear Island, Corn Dance, and Deep Lake units.
	Permit dogs for deer and hog hunting during part of the general gun season and for bird and raccoon hunting in the Turner River unit. Allow only bird dogs in the Corn Dance and Bear Island units. Prohibit all dogs in the Loop, Stairsteps, and Deep Lake units.	Permit dogs for deer and hog hunting during a portion of the general gun season and for bird and raccoon hunting in the Deep Lake, Turner River, Corn Dance, and Stairsteps units. Allow only bird dogs in Bear Island. Prohibit all dogs in the Loop unit.	Permit dogs for deer and hog hunting during part of the general gun season and for bird and raccoon hunting in the Turner River, Loop, and Stairsteps units. Allow only bird dogs in the Bear Island, Deep Lake, and Corn Dance units.	Allow only bird dogs in the Turner River unit; prohibit all dogs in all other units.

Visitor Use (cont.)	Proposed Action	Status Quo Alternative	Alternative A	Alternative B
ORV Use	Allow dispersed ORV use in the Turner River and Stairsteps units; allow ORV use only on designated trails in the Bear Island and Corn Dance units; prohibit ORV use in the Loop and Deep Lake units.	Allow unregulated ORV use in all units except the Loop unit; prohibit ORV use in the Loop unit.	Allow dispersed ORV use in all units except Bear Island; allow ORV use only on designated trails in Bear Island.	Allow ORV use only on designated trails in the Turner River and Stairsteps units, prohibit ORV use in all other units.
	In the Stairsteps unit allow only airboats south and east of Gator Hook Strand.			Same as proposed action.
ORV access points	Restricted access.	Unrestricted access.	Restricted access.	Restricted access.
• developed	14	0	19	12
• undeveloped	5	0	5	0
• road shoulders	18	unrestricted	27	10
Total	37	approximately 70	51	22
Canoe Trails	Provide parking areas at Forty Mile Bend and Trail Center for canoeing the Tamiami Canal.	No new facilities.	Same as proposed action.	No new facilities.
	Provide parking near Turner River for canoeing the river or canal; construct a picnic chickee downstream.		Same as proposed action.	
Florida Trail	Reroute segments of the trail to avoid established ORV trails and move trail to east side of Oasis.	No change.	Reroute trail to Ochopee; avoid established ORV trails.	Same as proposed action.
Frontcountry Camping	Develop six campgrounds with designated sites, tables, grills, potable water, toilets, and sewage disposal station.	Retain five unorganized camping areas; provide no services.	Same as proposed action, plus add a group campground near Pinecrest.	Develop four campgrounds with designated sites, tables, grills, potable water, toilets (provide sewage disposal station at Ochopee).
Backcountry Camping	Permit camping only at designated sites in Bear Island, Deep Lake, Corn Dance, and Stairsteps; camping at undesignated sites in other units.	Unregulated camping.	Permit camping only at designated sites in Bear Island; camping at undesignated sites in other units.	Permit camping only at designated sites in all units.
	Construct up to 50 backcountry shelters.	No new facilities.	Same as proposed action.	No new facilities.

Visitor Use (cont.)	**Proposed Action**	**Status Quo Alternative**	**Alternative A**	**Alternative B**
Picnicking	Construct new picnic ground at Oasis.	No new facilities.	Same as proposed action.	Same as proposed action.
	Retain Kirby Storter and H. P. Williams picnic areas.	Same as proposed action.	Same as proposed action.	Same as proposed action.
Recreational Access off I-75	Pedestrian access at mile-marker 31; no ORV access.	Unrestricted access.	Construct exit on I-75 at Cypress Lane, with ORV staging area for 50 cars.	Same as proposed action.
Concessions	Provide for concessioner-operated food service, guide service, ORV tours, and ORV storage at Pattons and Ochopee.	No new services.	Same as proposed action.	No new services.
Roads	Improve surface and under-drainage for Loop Road; retain existing alignment and width.	No change.	Widen and improve Loop Road.	Same as proposed action.
			Widen and improve Bear Island Road/Perocchi Grade for street-legal vehicles.	
			Construct exit on I-75 at Cypress Lane, with ORV staging area for 50 cars.	
Natural Resource Management				
Hydrology	Rehabilitate the Turner River and Birdon Road canals to restore more natural surface flows.	No action.	Same as proposed action.	Same as proposed action.
	Improve drainage under the Loop Road and Paces Dike to restore more natural sheet flows.	No action.	Same as proposed action.	Same as proposed action.
	Investigate the hydrological effects of the Bear Island Road; improve drainage if warranted.	No action.	Same as proposed action.	Same as proposed action.
Minerals	Allow oil and gas development to influence no more than 10% of the preserve at any one time.	Establish no oil and gas development limit.	Same as proposed action.	Same as proposed action.

Natural Resource Management (cont.)	Proposed Action	Status Quo Alternative	Alternative A	Alternative B
Minerals (cont.)	Prohibit surface occupancy for exploratory drilling and production in vegetation communities and cultural sites identified as important resource areas; restrict exploratory drilling/production in Bear Island to existing roads and pads; review plans of operations on a case-by-case basis in all other units to ensure compliance with PL 93-440 and 36 CFR 9B; allow regulated geophysical exploration in all units, subject to minerals management plan and proposed ORV regulations.	Permit regulated oil and gas exploration and development in all units.	Permit regulated oil and gas exploration and development in all units.	Prohibit surface occupancy for exploratory drilling and production in vegetation communities and cultural sites identified as important resource areas; restrict activity in Bear Island to existing roads and pads; allow exploration and production in northern section of Turner River; prohibit exploration/production in Deep Lake, Loop, Stairsteps, southern half of Corn Dance, and most of Turner River to protect important resources.
Vegetation	Expand exotic plant control and prescribed fire/wildfire suppression programs.	Continue existing programs.	Same as proposed action.	Same as proposed action.
Wildlife •Florida panther	Expand programs to protect the Florida panther, including habitat maintenance, reduction of human activity in habitat, reduction of hunting pressure on prey, continued research, public education, and cooperation with other agencies for possible reintroduction.	Continue existing programs.	Same as proposed action.	Same as proposed action.
•White-tailed deer and feral hogs	Improve habitat conditions and reduce hunting pressure on white-tailed deer.	Continue existing programs.	Same as proposed action.	Same as proposed action.
	Manage feral hogs only as prey for the Florida panther; otherwise eliminate hogs.		Same as proposed action.	Eliminate feral hogs as an exotic animal.
	Conduct a comprehensive ecological study of deer, feral hogs, and panther.		Same as proposed action.	Same as proposed action.
•Cape Sable seaside sparrow	Increase prescribed burning to maintain sparrow habitat; protect habitat from future oil and gas development.	Continue existing programs.	Same as proposed action.	Same as proposed action.

Natural Resource Management (cont.)	**Proposed Action**	**Status Quo Alternative**	**Alternative A**	**Alternative B**
•Red-cockaded woodpecker	Continue habitat management and protection.	Same as proposed action.	Same as proposed action.	Same as proposed action.
•*Liguus* Tree Snails	Manage under state regulations as a species of special concern; prohibit collection unless proved to be nonthreatening to the species.	Permit collection of tree snails with annual permit.	Same as proposed action.	Prohibit collection of tree snails.
•Other exotic animals	Selectively control.	Same as proposed action.	Same as proposed action.	Same as proposed action.
Cultural Resource Management	Actively manage sites on or eligible for the National Register of Historic Places; passively manage all other sites.	Passively manage all cultural sites.	Same as proposed action.	Actively manage all cultural sites.
NPS Operations	Rehabilitate the Big Cypress Lodge at Ochopee for administrative headquarters.	Maintain administrative headquarters in former residence at Ochopee.	Same as proposed action.	Move administrative headquarters to Oasis; remove all facilities at Ochopee and reclaim site.
	Rehabilitate and expand operational facilities at Oasis.	Maintain operational facilities at Oasis.	Same as proposed action.	Same as proposed action.
	Maintain existing housing at Ochopee and provide 29 additional units.	Maintain existing housing at Ochopee (9 units).	Maintain existing housing at Ochopee and provide 25 additional units.	Remove existing housing at Ochopee and reclaim site.
	Construct 4 housing units at Oasis.	No new facilities.	Construct 8 housing units at Oasis.	Construct 44 housing units at Oasis.
	Maintain housing at Trail Center.	Same as proposed action.	Same as proposed action.	Same as proposed action.
	Establish ranger station/ residences at Bear island and near Pinecrest.	No new facilities.	Same as proposed action.	No new facilities.
	Remove other outlying housing.	Maintain outlying housing	Maintain selected outlying housing; remove others.	Same as proposed action.

Table 19: Summary of the Impacts of the Proposed Action and Alternatives

Impact Topic	Impacts of the Proposed Action	Impacts of the Status Quo Alternative	Impacts of Alternative A	Impacts of Alternative B
Surface Water Flows	More natural flows restored to approximately 38,000 acres	Continued altered flows on approximately 38,000 acres	Same as proposed action	Same as proposed action
	Approximately 7 acres of flow displaced by new NPS development		Approximately 45 acres of flow displaced by new NPS development	More natural flows restored to an additional 93 acres at Ochopee
	Up to 203 acres potentially displaced by new oil and gas development	Up to 215 acres potentially displaced by new oil and gas development	Similar to the status quo alternative	Up to 39 acres potentially displaced by new oil and gas development
	Southern Big Cypress and Everglades potentially subject to surface water flow alterations due to oil and gas development	Same as proposed action	Same as proposed action	Southern Big Cypress and Everglades protected from alteration of surface water flow
Water Quality	Southern Big Cypress and Everglades potentially subject to spills or leaks from petroleum operations	Same as proposed action	Same as proposed action	Everglades and most of the Big Cypress protected from spills or leaks from petroleum operations
		Continued illegal dumping of an estimated 6,000 gallons of raw sewage per year from recreational vehicles		
Cypress Strands/Mixed-Hardwood Swamps/ Sloughs and Cypress Domes	More natural hydroperiod restored to approximately 11,000 acres	Continued abnormal hydroperiod effects on approximately 11,000 acres	Same as proposed action	Same as proposed action
	Recovery of approximately 55 acres of ORV trails	Continued occupancy of approximately 150 acres for ORV trails	Recovery of approximately 37 acres of ORV trails	Recovery of approximately 70 acres of ORV trails
	Melaleuca controlled on much of the 2,550 acres already invaded	Potential expansion of melaleuca on the 2,550 acres already invaded	Same as proposed action	Same as proposed action
	Approximately 1.5 acres occupied by new NPS development	No additional area occupied by NPS development	Approximately 17 acres occupied by new NPS development	Approximately 0.5 acre occupied by new NPS development

Impact Topic	Impacts of the Proposed Action	Impacts of the Status Quo Alternative	Impacts of Alternative A	Impacts of Alternative B
Marshes	More natural hydroperiod restored to about 7,000 acres	Continued abnormal hydroperiod effect on about 7,000 acres	Same as proposed action	Same as proposed action
	Recovery of approximately 120 acres of ORV trails	Continued occupancy of approximately 450 acres for ORV trails	Same as proposed action	Recovery of approximately 250 acres of ORV trails
	Melaleuca controlled on much of 500 acres already invaded	Potential slow expansion of area invaded by melaleuca	Same as proposed action	Same as proposed action
	Less than 1 acre occupied by new NPS development	No additional area occupied by NPS development	Approximately 3 acres occupied by NPS development	Same as proposed action
	Marshlands protected from oil and gas development surface occupancy	Marshlands potentially subject to oil and gas development	Same as status quo alternative	Same as proposed action
Mangrove Forests	Mangroves protected from oil and gas development surface occupancy	Mangroves potentially occupied by oil and gas development	Same as status quo alternative	Same as proposed action
	Mangroves in Big Cypress and Everglades potentially subject to petroleum-related spills or leaks	Same as proposed action	Same as proposed action	No impact
Old-Growth Pinelands	Most existing old-growth pinelands maintained	Potential loss of some old-growth pinelands to wildfire and hardwood invasion	Same as proposed action	Same as proposed action
	Recovery of approximately 9 acres of ORV trails	Continued occupancy of approximately 54 acres for ORV trails	Same as proposed action	Recovery of approximately 29 acres of ORV trails
	Melaleuca controlled on 50 acres already invaded	Potential expansion of melaleuca	Same as proposed action	Same as proposed action
	Old-growth pinelands protected from effects of oil and gas development	Old-growth pinelands potentially subject to oil and gas development	Same as status quo alternative	Same as proposed action

Impact Topic	Impacts of the Proposed Action	Impacts of the Status Quo Alternative	Impacts of Alternative A	Impacts of Alternative B
Hardwood Hammocks	Most hardwood hammocks maintained	Potential wildfire damage to some hammocks	Same as proposed action	Same as proposed action
	Recovery of approximately 8 acres of ORV trails	Continued occupancy of about 15 acres for ORV trails	Recovery of 6 acres of ORV trails	Recovery of about 12 acres of ORV trails
	About 1 acre occupied by new NPS development	No additional area occupied by NPS development	About 5 acres occupied by by new NPS development	About 1 acre occupied by new NPS development
	Approximately 15 acres of previously disturbed areas used for backcountry camping	Same as proposed action	Same as proposed action	
Florida Panthers	Probable moderate improvement in numbers and health of panther population	Possible decline in numbers and health of panther population	Possible improvement in numbers and health of panther population, but less than proposed action	Greatest probable improvement in numbers and health of panther population
Cape Sable Seaside Sparrows	Maintenance and potential expansion of sparrow populations	Maintenance of sparrow populations	Same as status quo alternative	Same as proposed action
Red-cockaded Woodpeckers	Maintenance of an estimated 40 colonies, with potential long-term increase in habitat and colonies	Same as proposed action	Same as proposed action	Same as proposed action
Bald Eagles	No effect	No effect	No effect	No effect
Liguus Tree Snails	Populations protected	Continued losses of snails due to collection	Same as proposed action	Same as proposed action
White-tailed Deer and Feral Hogs	Probable moderate increase in populations	Possible suppression of populations	Probable limited increase in populations, but less than proposed action	Greatest probable increase in populations
Air Quality	Impacts unknown	Impacts unknown	Impacts unknown	Impacts unknown

Impact Topic	**Impacts of the Proposed Action**	**Impacts of the Status Quo Alternative**	**Impacts of Alternative A**	**Impacts of Alternative B**
Cultural Resources	Protection of sites on or eligible for the National Register of Historic Places and of important native American sites	Limited protection of cultural sites; possible adverse effects from increased recreational activities and potential mineral production	Less protection of cultural sites than under the proposed action; potential adverse effects from dispersed ORV use	Greatest protection of cultural resources
Hunters and Hunting	Decrease in number of hunters during the general gun season by 40% – 60%	Continued growth in the numbers of hunters during the general gun season after first nine days (quota limit)	Number of hunters stabilized at current levels	Decrease in the number of hunters during the general gun season by as much as 75%
	Limited hunter access by ORVs	Relatively unrestricted hunter access by ORVs	Minor restrictions on hunter access by ORVs	Major restrictions on hunter access by ORVs
	Hunting deer and hogs with dogs greatly limited	Continued widespread use of hunting dogs during the nine-day quota limit	Moderate limitations on hunting deer and hogs with dogs	Hunting deer and hogs with dogs prohibited
	Conditions for hunting with primitive weapons improved in two units			
	Overall increase in formal regulation of hunting	Big Cypress one of the least regulated hunting areas of Florida	Overall increase in formal regulation of hunting	Hunting tightly regulated
ORV Users	Probable decrease in total ORV use; recreational use increase of 14% by year 2000	Continued increase in ORV use (14% or more by year 2000)	Same as proposed action	Similar to proposed action
	Decrease in hunting-related ORV use by 25% – 50%		Hunting-related ORV use stabilized at current levels	Decrease in hunting-related ORV use by as much as 75%
	20% decrease in ORV trails	No change in trails	10% decrease in ORV trails	34% decrease in ORV trails
	Increase in formal regulation of ORVs	Continued relatively unrestricted ORV use	Moderate increase in formal regulation of ORVs	ORV use closely regulated and concentrated in two units

Impact Topic	Impacts of the Proposed Action	Impacts of the Status Quo Alternative	Impacts of Alternative A	Impacts of Alternative B
Other Visitors	More interpretive and recreational opportunities for the general public	Few opportunities for interpretation or recreation for the general public	Same as the proposed action	Limited increase in interpretive and recreational opportunities for the general public
	Many nonhunting visitors less threatened by the possibilities of accidental shooting during hunting seasons	Continued avoidance by many nonhunting visitors during hunting seasons because of a perceived threat of accidental shooting	Same as proposed action	Same as proposed action, except further reduction of threat because of prohibition on hunting in three units
				Very low visitation to Deep Lake and Corn Dance units because of difficult backcountry access by foot
Nonfederal Property Owners	Possible inconvenience to owners of exempt inholdings because of ORV use restrictions	Little change in traditional use patterns and activities	Possible inconvenience to a few owners of exempt inholdings because of ORV use restrictions	Inconvenience to most owners of exempt inholdings because of ORV use restrictions
	Possible reduction in the personal and monetary values of some backcountry inholdings because of hunting restrictions	No effect	Same as proposed action	Same as proposed action
Mineral Interests	Potential effects on mineral interests if future oil and gas development affected 10% of preserve, forcing the delay of any additional development for several decades	No limit on oil and gas exploration and development activities	Same as proposed action	Same as proposed action
	In Bear Island approximately 80% of oil and gas resources accessible	In Bear Island 100% of oil and gas resources potentially accessible	Same as status quo alternative	In Bear Island approximately 80% of oil and gas resources accessible
	South of Bear Island approximately 80% of oil and gas resources accessible			South of Bear Island access to oil and gas resources severely limited

AFFECTED ENVIRONMENT

NATURAL RESOURCES

WATER RESOURCES

The Big Cypress swamp is a recognized physiographic province in southwestern Florida. It is a source of recharge for the shallow aquifers of south Florida and is important to the integrity of the water resources in the western part of Everglades National Park. The hydrological features of the swamp were recognized by Congress when it established Big Cypress National Preserve.

The water regimen of the area largely determines the patterns in which temperate and tropical vegetative communities and their related wildlife species occur. During the wet season (summer and fall) when heavy rains lead to widespread surface inundation, the almost imperceptible slope of the land creates an overland sheet flow during the wet season. During the dry season (winter and spring) natural surface water flows are confined to the lower elevations of strands, swamps, and sloughs. The preserve has been mapped by the U.S. Fish and Wildlife Service as part of the national wetlands inventory. The majority of preserve lands are classified as wetlands; exceptions are scattered hardwood hammocks, some pinelands, and artificially filled areas.

Big Cypress is essentially a self-contained hydrologic unit. Only three small areas (approximately 5 percent of the preserve) receive flows from external drainages. These areas include less than 5 square miles in the Okaloacoochee Slough, about 30 square miles in the Mullet Slough component of the Everglades drainage, and approximately 40 square miles in the southeastern corner of the preserve along the western boundary of the Shark River Slough.

Water Flows

Much of Big Cypress National Preserve is flooded during the rainy season, generally May through October, when nearly 80 percent of the rain falls. Rainfall averages 54 inches per year, but it has ranged from 35 inches to 80 inches per year. Summer rains are usually short, intense, and frequent. Winter rains are a result of frontal systems, and they last longer and have less intensity. Hurricanes occur most frequently in September and October and usually bring torrential rainfall.

During the rainy season shallow depressions fill with water. Because of the poor drainage, water stands on the land until it evaporates, infiltrates to the underlying aquifer, or slowly drains off through sloughs or strands. Thus, at the peak of the rainy season as much as 90 percent of the preserve is inundated to depths ranging from a few inches to more than 3 feet. When the dry season begins, the water level starts to recede. The recession normally continues into May, when perhaps only 10 percent of the preserve is covered by water in ponds, cypress domes, and sloughs.

Flows generally follow bedrock undulations, which run mostly northeast to southwest and range in relief from approximately 1 foot to as much as 10 feet. Marshy sloughs occupy the shallower undulations, and cypress stands and mixed hardwood swamps grow in the deeper ones. These relatively low channels control surface water flows because the water table is below the crests of the undulations most of the time; even during high water, the bedrock channels still carry a relatively large volume of water.

The preserve is underlain by a shallow aquifer extending from the vicinity of Forty Mile Bend to the west coast of Florida and covering almost all of Collier County and the upper part of Monroe County. The aquifer is the prime source of freshwater for human use in Collier County and adjoining parts of Lee and Hendry counties. It is about 130 feet thick in western Collier County and becomes progressively thinner to the east, where it eventually disappears in the vicinity of Forty Mile Bend. Throughout much of the preserve, the limestone of this shallow aquifer is within 10 feet of the surface. The aquifer is replenished primarily by the infiltration of rainfall. During the rainy season groundwater levels are high. By May, the usual end of the dry season, water levels normally reach their annual lows.

The southwestern corner of the preserve, including the Ochopee and Burns Lake areas, was mapped for floodplains by the Federal Emergency Management Agency (flood insurance rate map #120067-0325A). According to that map, the headquarters and residential area at Ochopee are within the 100-year floodplain. Flooding at Ochopee would be caused by a hurricane storm surge and could flood the area to a depth of 8 feet above mean sea level. The existing development is approximately 4 feet above mean sea level, so that in a 100-year flood, waters at Ochopee could be 4 feet deep. The Burns Lake campground is on the boundary of the 100-year and 500-year floodplains. Because the site is elevated on fill, the campground is slightly above the 100-year flood level. There are no areas within the preserve in the coastal high hazard area, and no areas are subject to flash flooding.

Water Quality

The water in Big Cypress is relatively unpolluted. Concentrations of nitrogen, phosphorus, total organic carbon, and persistent pesticides, which often serve as indicators of pollution, are generally similar to concentrations in nearby, relatively uninhabited areas, and concentrations are considerably less than those of nearby urbanized areas. Water quality changes occur seasonally and diurnally in Big Cypress and are related to the natural hydrologic and biologic regimes. The seasonal recession of water levels triggers physical, chemical, and biological changes in water quality. During low water, diurnal fluctuations in dissolved oxygen are greatest as a result of the high concentration of organisms in the remaining water. During the day plants produce excess oxygen by photosynthesis. At night dissolved oxygen decreases as photosynthesis ceases and respiration demands are met. Fish kills sometimes occur during periods of low dissolved oxygen; they have been observed in the spring in the Tamiami Canal about 10 miles west of Forty Mile Bend, and often they spread both east and west for several miles.

Despite high fluctuations in dissolved oxygen, the overall water quality of the preserve, as determined from baseline data obtained in 1969-70, is good, although a significant potential for degradation exists. Present ecosystems have adapted to the naturally low nutrient levels throughout the preserve, and the potential exists for substantial changes in ecological processes locally from sewage dumping or more broadly from the introduction of nutrients and pesticides in agricultural runoff. Temporary, localized water quality problems have already occurred due to petroleum-related spills and leaks and the illegal discharge of untreated sewage from recreational vehicles. These and other potential threats are described further in the "Environmental Consequences" section.

Man-Made Interruptions of the Water Flow

The natural water regimen of the preserve has been modified by man-made structures. Most significant are the canals and roads that interrupt the natural drainage. Man-made developments that have disrupted or may significantly disrupt surface flows are described below and under "Impact on Water Quality" in the impact discussion for the proposed action.

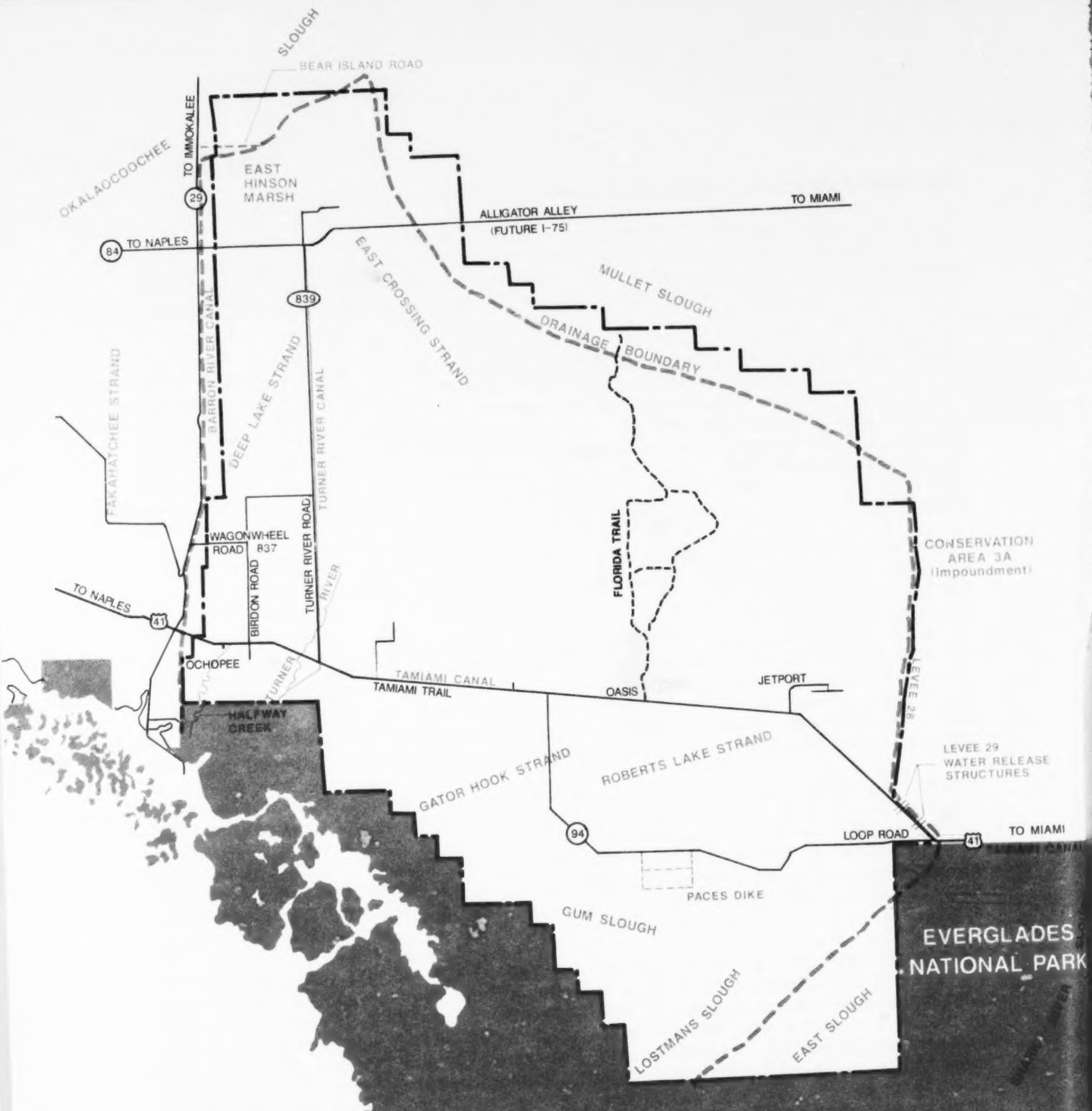
Turner River Canal and Birdon Road Canal. The Turner River canal was constructed to provide fill during the construction of the Turner River Road in 1960. The canal originates just north of Alligator Alley (at the southern end of the East Hinson Marsh) and enters the Turner River north of US 41. As such, it provides a direct hydraulic connection between the freshwater uplands of the preserve and the saline estuaries within Everglades National Park. The canal also affects adjacent areas by altering the groundwater table, disrupting natural flow patterns, and reducing river stages and flow rates in the upper portions of the Turner River.

Birdon Road, along with its associated borrow canal, was constructed in the late 1960s and early 1970s. The borrow canals drain an area west of Turner River and north of Ochopee.

Loop Road. The Loop Road interrupts water flow because the bridges and culverts are inadequate for transmitting the flow of water southward, and the road itself is regularly overtopped during the wet season. Although there are three 57-foot-wide bridges and seven metal pipe culverts in the 8-mile stretch west of Forty Mile Bend, differences of 6 inches or more have been observed in water levels above and below the road. This condition also exists to some degree along the rest of the road.

Paces Dike. Paces dike is a low dike or levee surrounding a 1,340-acre area south of the Loop Road. Built before the land was acquired for the national preserve, the dike consists of material from a borrow canal just inside the dike. The intent was to reduce water levels within the diked area by pumping enough water into the borrow canal to allow cultivation. The area drained is of little hydrologic significance, and the limited effect could be easily mitigated by breaching the dike along both the northern and southern sides.

Levees 28 and 29. Levee 28 extends northward from US 41, along the eastern boundary of Big Cypress, and it forms the eastern boundary between the Big Cypress and Everglades drainage systems. It was constructed in the 1960s to control floods and to protect the Jetport site. The levee is approximately 18 miles long, with a 1.5-mile extension to the west at the northern end. The borrow canal along the upper 5 miles of the levee is on the east side; along the remainder of the levee the canal is on the west side. There is a regulated culvert at the changeover, where water can be released in either direction between the Big Cypress and Everglades drainages.


SLOUGH
BEAR ISLAND ROAD
OKALAOCOOCHEE
TO IMMOKALEE
29
EAST
HINSON
MARSH
TO MIAMI
ALLIGATOR ALLEY
(FUTURE I-75)
84
TO NAPLES
EAST CROSSING STRAND
MULLET SLOUGH
839
BARRON RIVER CANAL
DEEP LAKE STRAND
TURNER RIVER CANAL
DRAINAGE BOUNDARY
FAKAHATCHEE STRAND
FLORIDA TRAIL
WAGONWHEEL
ROAD 837
BIRDON ROAD
TURNER RIVER ROAD
RIVER
CONSERVATION
AREA 3A
(impoundment)
TO NAPLES
41
OCHOPEE
TURNER
TAMIAMI CANAL
TAMIAMI TRAIL
OASIS
JETPORT
LEVEE 28
HALFWAY
CREEK
LEVEE 29
WATER RELEASE
STRUCTURES
GATOR HOOK STRAND
ROBERTS LAKE STRAND
94
LOOP ROAD
41
TO MIAMI
PACES DIKE
GUM SLOUGH
EVERGLADES
NATIONAL PARK
LOSTMANS SLOUGH
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HYDROLOGY

BIG CYPRESS NATIONAL PRESERVE

United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,045 ·A

Recent findings have indicated that levee 28 affects both the preserve and Everglades National Park. Water that otherwise would flow west from the heavily managed conservation area 3A toward the Big Cypress basin is held back by the levee, except for periodic releases through S-343 culverts and the "crossover" culverts. As a result, additional water in the conservation area has been released into Everglades National Park with deleterious effects.

Inflows from the north are much greater now than ever before and have had a tremendous effect on the preserve and the Everglades. In the early 1980s the long-standing policy of backpumping Everglades agricultural area water into Lake Okeechobee was stopped by the state because of deteriorating water quality in the lake. With backpumping no longer occurring, the southward flows through the conservation areas were greatly increased, which affects Everglades National Park and the eastern portion of the preserve when the culverts are opened.

Levee 29 connects with levee 28 at Forty Mile Bend and parallels US 41 eastward toward Miami, and it dams Shark River Slough to hold water in conservation area 3A. The impoundment of Shark River Slough has caused serious ecological damage to Everglades National Park because natural hydroperiods have been disrupted. Recently the National Park Service has worked with the South Florida Water Management District and the U.S. Army Corps of Engineers to develop a schedule of water releases from conservation area 3A into the Shark River Slough to simulate natural water flows. Because of this program, releases of surplus water into Big Cypress (six times between August 1985 and April 1987) are necessary. Water is released through gates in levee 28 (between levee 28 and Forty Mile Bend), and on occasion releases have raised water levels along the Loop Road east of Pinecrest. The lack of adequate culverts and bridges to permit normal water flow under the Loop Road can aggravate road flooding.

Oil and Gas Operations. If not carefully placed and operated, oil and gas development could significantly affect water resources by interrupting natural flows and by releasing pollutants through spills, pipeline leaks, and seepage. Potential impacts on water resources are discussed in detail in the "Environmental Consequences" section (see also the minerals management plan in appendix C).

I-75 Construction. The construction of I-75 will affect a 12-mile-long corridor in Big Cypress east of Florida 29. Project plans by the Florida Department of Transportation and the Federal Highway Administration propose building two additional lanes on the north side of Florida 84 between the present levee and the borrow canal and providing potential access points for oil and gas operations. An additional 125 feet of new right-of-way on the south side of the existing roadway would be acquired for water management purposes. The plans propose a new canal in this right-of-way, possibly 8 to 10 feet deep and 40 to 80 feet wide, to distribute the water from the culverts and bridges laterally. The intent would be to prevent any damming effect of the roadway and to distribute the flow uniformly downstream.

ORVs. The only study about the effects of ORV trails on water resources concluded that their impact is essentially negligible (Duever et al. 1981). The study made an extensive survey of water flows in ORV trails. It found that flows were likely to increase along ORV trails as water receded at the end of the wet season, but major trails are too widely scattered and too often on higher ground to be effective watercourses. Trails have little impact on continued localized flow after overland sheetflow ceases because they frequently cross slight rises in the bedrock that act as water-breaks.

MINERALS

The 1974 legislation for Big Cypress (PL 93-440) provided for numerous uses, including the extraction of oil, gas, and other minerals, so long as this development is not detrimental to the purposes of the preserve. If the National Park Service determines that oil and gas extraction is detrimental, the rights to these minerals might be acquired. Even though the act mentions other minerals (for example, phosphate rock, limestone, marls, and peat), most of the rights to these minerals were acquired by the federal government, and only oil and gas are known to occur in economic deposits in the preserve.

Geologic Formations

The Florida Peninsula rests on a structural backbone of deep-seated igneous and metamorphic rocks of Precambrian age (at least 650 million years old). In the preserve these basement rocks are covered by approximately 17,000 feet of sedimentary rocks ranging in age from Late Jurassic-Early Cretaceous (140 million years old) at the contact with the basement rock surface to early Pleistocene (1.5 million years old) at the surface. Sediments in the upper part of the sedimentary sequence, at depths of 3,000 to 5,000 feet, consist mainly of clastic materials such as sands, silts, clays, marls, and shellbeds, as well as carbonates composed of limestones and dolomites. Sediments in the deeper parts of the sedimentary sequence, at depths of 10,000 to 12,000 feet, consist of an organic-rich sequence of carbonate beds. This layer is known as the Sunniland formation, and it is the current focus for oil and gas exploration in south Florida (Pontigo et al. 1979). Ancient reef areas on the trend have especially high potential for oil and gas deposits because the coral trapped vegetative matter, which subsequently decomposed and turned into oil.

Oil and Gas Exploration and Production

Oil-producing zones in the Sunniland formation occur in a northwest-southeast direction across the southern end of the Florida Peninsula, from the Lehigh Park field in Lee County to the Forty Mile Bend field in Dade County (a distance of about 145 miles). The width of the trend is estimated to be 12 miles. All the active wells in the preserve and all the major discoveries in south Florida have been on the Sunniland trend, and based on the geologic potential, the petroleum industry has tended to explore areas on the trend more thoroughly than areas off the trend. Two of the 11 fields so far discovered on the trend are in the preserve – Bear Island and Raccoon Point. The trend is estimated at 1,100,000 acres, of which 19,180 acres (or about 1.74 percent) have been developed as fields (Florida Department of Natural Resources, Applegate and Pontigo 1984).

Other formations besides the Sunniland in south Florida have had shows of oil and gas, but there is no current production from these formations, and very little is known about potential production. Oil and gas could be discovered in one of these formations off the Sunniland trend and south of US 41 in the preserve. One such formation, the Trinity C, is currently being evaluated by Exxon; but because of the small amount of data, no statistical projections can be made. Oil and gas could also be found in formations deeper than the Sunniland. At this time very few wells are drilled deeper, so there is no information for projections. One of five dry holes drilled south of US 41 went to 16,000 feet, 4,000 feet deeper than the Sunniland, but it was not productive.

The Bear Island field (discovered in 1972) includes 23 wells on nine pads, all operated by Exxon Company, U.S.A. Of these 23 wells, nine are producing wells, eight are shut-in, one is a saltwater disposal well, and five are plugged and abandoned. Approximately 9 miles of access roads and 20 miles of pipeline service this field. The Raccoon Point field (discovered in 1978) includes 17 wells on five pads, all operated by Exxon. Of the 17 wells, 14 are in production, one is uncompleted, one is a saltwater disposal well, and one is shut-in. Approximately 15 miles of access roads, including the Eleven Mile Road off US 41, and 14 miles of pipeline service this field. More pads and wells are anticipated in the near future under Exxon's 1981 *Master Plan of Operations*.

The only company with active production in the preserve through 1988 was Exxon. Further interest, however, in the east Bear Island area has been expressed for a wildcat well at an existing abandoned pad. This operation would include upgrading approximately 5 miles of road, expanding the existing pad by approximately 1 acre, and constructing an undetermined amount of pipeline. This operation would be accessed from Florida 29 and the Bear Island Road.

Since 1970 four geophysical operations (i.e., the placement of lines to seismically determine the potential for oil or gas) have been conducted or partially conducted in Big Cypress, according to the Florida Department of National Resources and NPS records or plans of operations. The placement of seismic lines has affected a total of 474 miles and include the following:

Mobil, 1970-71, 13 lines, 151 miles total
Bass, 1974, seven lines, 64 miles total
Exxon, 1976-77, 20 lines, 254 miles total
Shell, 1988, one line, 5 miles total

Many of the seismic lines built from 1970 to 1977 were still visible on 1984 high altitude infrared aerial photographs because they have been reused as ORV trails or for other unknown reasons.

Currently oil and gas exploration and development plans are reviewed on a case-by-case basis under NPS regulations at 36 CFR 9B. Several other federal, state, and county laws, regulations, permits, and procedures also apply to mineral operations in the preserve. NPS regulations require proof of compliance with these other laws, regulations, permits, and procedures before a plan of operations is approved (36 CFR 9.36(a)(15)).

Ownership of Mineral Rights

Oil and gas rights cannot be acquired by the federal government without the consent of private owners unless development or use could be detrimental to the preserve. Lands acquired by the National Park Service for the preserve have generally included a base fee estate, consisting of all mineral rights previously held by the grantor. However, there are two exceptions: Oil and gas rights that were not specifically included in the base estate; and oil, gas, or mineral rights that were previously retained or held by third parties. Most oil and gas rights within the preserve are owned by the Collier Corporation, under various corporate names (Collier owns 75 percent of the oil and gas rights in most sections of the Collier County portion of the preserve). The ownership of the remaining oil and gas rights includes corporate and private holdings, a relatively small amount of state ownership (approximately 4 percent), and a lesser amount of county ownership (the Jetport). Within the preserve, 1,965 mineral owners are listed on county tax rolls. This figure, however, represents a relatively small though widely scattered percentage of the nonfederal mineral owners in the preserve. Oil and gas ownership consists of thousands of fractional divided interests (separate parcels) and undivided interests (separate rights in the same parcel), including extremely complex leasehold and royalty rights on an estimated 46,000 tracts (50,000 to 150,000 owners).

Oil and Gas Development Phases

The four general phases of oil and gas development are described below to enable readers to better understand the alternative plan scenarios and the discussions relating to each impact topic in the "Environmental Consequences" section. The four phases are exploration, drilling, production, and abandonment / reclamation. Some impacts occur during all four phases, and others are associated only with one or two phases. A brief description of each phase, adapted from Tetra Tech, Inc. (1987), follows.

Exploration. Exploratory operations define and describe geological structures that are favorable for oil and gas accumulation in the earth's crust. Potential traps where oil and gas might occur, such as anticlines, faults, or formations with favorable porosity and permeability, can be identified and mapped in a process generally referred to as geophysical exploration. Geophysical exploration includes gravitational surveys, magnetic surveys, and seismic surveys (the predominant method used in the south Florida area). Seismic surveys are conducted by generating an energy wave that is directed downward toward the subsurface formations of interest. Reflections of the energy waves off the subsurface formations are recorded on the surface. The data are then analyzed with the aid of sophisticated computer programs. The energy waves are generated using either dynamite or "vibroseis" trucks. Field equipment can include small drill rigs, hand-held drills, large vibroseis trucks, and vehicles to haul surveying equipment, recording equipment, and computers.

Drilling. Stratigraphic test drilling, also called core drilling, often supplements a detailed geophysical exploration program and is used to further define and confirm seismic data. Once the surface and subsurface geological and geophysical data are interpreted and a potential hydrocarbon trap is located, exploratory holes are drilled to search for actual deposits of crude oil and natural gas. This form of drilling goes beyond that encompassed by stratigraphic test drilling and is known as wildcatting.

When a wildcat well strikes an oil or gas deposit, additional wells are drilled to establish the extent and commercial viability of the field. Wells are tested for productivity, then either completed for production or plugged and abandoned. If a good producing zone is found, then support facilities are brought in to allow production. Development of a field may take many years, continuing on through the beginning stages of production.

Production. Once a well has been drilled and cased, it is completed, and if necessary, stimulated into production by using a variety of methods. Production levels increase as an oil and gas field is developed with additional wells and production equipment. Reservoir limits are determined and temporary facilities are replaced by permanent installations. Production facilities usually include road systems, wellhead and pumping equipment, storage tanks, oil and water separation equipment, natural gas processing equipment, water disposal equipment, and pipelines.

Abandonment and Reclamation. The life spans of oil and gas fields vary because each field has unique characteristics. Such factors as reserves, reservoir characteristics, the nature of the petroleum, subsurface geology, and political, economic, technological, and environmental constraints all affect a field's life span. The average life of a "typical" field in the preserve is estimated to be 40-80 years. Reclamation generally involves filling any pits, ditches, and other excavations; removing or covering all debris; and restoring the surface of the land and the access road to their former conditions. Vegetation restoration in the preserve includes the use of native plant species and an emphasis on methods to reduce or eliminate exotic plant encroachment.

AIR QUALITY

Big Cypress National Preserve has been designated as a class II area under the Clean Air Act (42 USC 7401 et seq.). Everglades National Park, which shares most of its northern boundary with the preserve's southern boundary, has been designated a class I area. It is not known if baseline data for particulate matter or sulfur dioxide emissions have been established by the state of Florida for the preserve. Existing major stationary air pollution sources near Big Cypress and Everglades include oil-fired power plants at Fort Myers, Palm Beach, and Turkey Point; sugar cane processors near Clewiston and Belle Glade; and a portland cement plant in western Dade County. It is unknown whether emissions from these sources have consumed some of the class I and II increments (if the sources were constructed or expanded after the baseline was established, then consumption of the increments may have already taken place).

Prevailing winds carry emissions from the metropolitan areas and regional oil-fired power plants into the preserve. Regional haze and smoke plumes have been observed. Airport observation data indicate a visual range of 10 to 15 miles.

There is an ozone monitor at Pinecrest within the preserve, and other data are available from monitoring being conducted in Everglades National Park and surrounding areas by the counties, the state, the National Park Service, and the Florida Power and Light Company.

The Clean Air Act gives responsibility to the federal land manager (that is, the superintendents of Big Cypress and Everglades) to protect the resources within their management areas. Significant degradation beyond the increments permitted by state and federal air quality programs in Big Cypress would in all probability also affect the air quality of Everglades National Park.

The Clean Air Act requires that all national monuments, primitive areas, and preserves (including Big Cypress) be reviewed for possible redesignation to class I status if their air quality related values are considered important attributes. These values include visibility, plants and animals dependent on the air environment, water quality, and historic and archeological objects and structures. In 1979 the National Park Service found that the air quality related values at Big Cypress were indeed important attributes, and on June 25, 1980, the preserve was one of 47 units listed by the secretary of the interior for consideration by the states and Indian tribes for redesignation to class I (45 FR 43002). To date the state of Florida has not acted on this recommendation.

As of July 1, 1985, Dade County was exceeding the national ambient air quality standard only for ozone. The other counties in which the preserve is located were either unclassified or were attaining the standards. The acidity of rainfall in south Florida has increased recently. The limestone bedrock appears capable of buffering the impacts of acid rain on the surface water; however, the effects of atmospheric deposition on vegetation are not known.

Emissions from producing oil fields, such as those in the preserve, typically include nitrogen oxides, volatile organic compounds (precursors to ozone, which can damage vegetation such as orchids and bromeliads), hydrogen sulfide, and sulfur dioxide. The Florida Department of Environmental Regulation (1986) estimates that the Raccoon Point field produces 350 tons per year of nitrogen oxide and other pollutants. Also on a 1987 trip to the Raccoon Point field, NPS air quality scientists observed visible injury to air-breathing plants and slash pines similar to that caused by air pollutants.

Temporary, minor air quality degradation within the preserve is caused by campfires, visitor vehicle operation, and NPS maintenance and management activities. Prescribed fires to reduce the possibility of major forest fires and to protect natural vegetative communities are conducted under the best meteorological conditions to maximize pollutant dispersal and minimize impacts on metropolitan areas. Prescribed burning activities are coordinated through the Florida Department of Forestry permit system to ensure compliance with state air quality regulations.

VEGETATION

The dominant tree in the preserve is cypress. Two species have been identified – bald (*Taxodium distichum*) and pond (*T. ascendeus*), although the taxonomic distinctions are still in question. Cypress are deciduous trees that can grow to 130 feet tall and reach diameters of 7-10 feet. Most of the larger cypress trees have been removed by logging, and only a few large trees remain. Cypress trees are highly resistant to fire and thrive in saturated soils.

Temperate plants are abundant in Big Cypress, but the majority of species are tropical. Pinelands, cypress domes and strands, prairies, and marshes are the most prevalent vegetation types in the preserve and are dominated by temperate species. Tropical species primarily occur in hardwood hammocks, but are also found in pinelands, mixed-hardwood swamps, and cypress strands. Endemics – plants native only to the preserve area – comprise 10 percent of the Big Cypress vegetation (Long 1974).

Major Vegetation Types

Eleven major vegetation types can be described for the preserve: cypress domes, cypress strands, mixed-hardwood swamps, hardwood hammocks, pinelands, cypress prairies, marshes, prairies, sloughs, mangroves, and disturbed areas. Each of these types is described below.

Cypress Domes. Cypress domes occur throughout Big Cypress, particularly in the central and eastern portions. They are characterized by a monospecific overstory of cypress, which grow tallest in the center of a limestone depression and taper off toward the fringes, forming a domelike feature. This depression in the bedrock fills with organic soils and eventually peat forms due to constant saturation and slow decomposition. The largest and fastest growing cypress trees are found in these wetter, deeper peat deposits. Trees toward the dome edge are thought to be smaller because of more marginal soils, lower water levels, and more frequent susceptibility to fires (Duever et al. 1979). Flooding is essential for maintaining cypress domes, and a 290-day hydroperiod is average for domes; average maximum water levels reach about 2 feet (Duever et al. 1986a). Periodic fires play an important role because they limit hardwood invasion, remove peat (which helps maintain the site's hydroperiod), and generally leave the cypress unharmed (see "Fire Ecology and Management" section). Ponds often form in the center of cypress domes and are important habitat for alligators and aquatic wildlife. These ponds are likely the result of deep-burning peat fires that occurred during extreme droughts or the dissolution of limestone by acids in plant litter accumulations (Loveless 1959).

Cypress Strands. Cypress strands are found throughout the preserve in deep mineral soil depressions, but they are distinct from cypress domes because they form along major drainages and generally retain a north-south orientation. Dominant vegetation features, when present, are very large cypress trees, a few over 100 feet tall and 6 feet in diameter. Understory vegetation is diverse, unlike cypress domes, and includes shade-tolerant hardwoods, ferns, and epiphytes. All cypress strands within the preserve have been logged, and many sites are now more characteristic of the mixed-hardwood swamps described in the following section. Cypress strands are also associated with relatively deep water, with a hydroperiod that extends over 240 days. Even though cypress strands rarely burn, evidence indicates that they may benefit from infrequent fires because cypresses are highly fire-resistant and competing hardwoods are not.

Mixed-Hardwood Swamps. The logging of overstory bald cypresses in some strands has resulted in domination by former subcanopy hardwood species, such as maple (*Acer rubrum*) and pop ash (*Fraxinus caroliniana*). Bald cypresses are often present, but they are no longer the dominant overstory trees. If the area remains relatively undisturbed, cypresses often return in impressive numbers. Understory species include ferns, epiphytes, aquatic species, and saplings of overstory vegetation. Older successional stages are dense and quite complex in terms of structure and species. Knolls within this vegetation type comprise a principal habitat for the rare royal palm (*Roystonea elata*), and older forests serve as homes for a large number of birds, mammals, reptiles, and amphibians (Forest Service, Wade et al. 1980a). Mixed-hardwood swamps occupy peats, sands, and rock and have a 270-day or longer hydroperiod.

Hardwood Hammocks. Hardwood hammocks are dense and diverse forests of hardwood trees and shrubs, ferns, and epiphytes that grow on land slightly higher than that of surrounding marshes and prairies. Hammocks are scattered throughout the preserve, and because of their raised position, they often appear as islands of trees. Dominant overstory species are usually oak (laurel oak, *Quercus laurifolia*; water oak, *Q. nigra*; and live oak, *Q. virginiana*) or tamarind (*Lysiloma bahamensis*). Oak is more prevalent in the northern portion of the preserve than the frost-susceptible tamarind. Elevated bedrock overlain by sandy peat soils comprises the foundation of the hammocks. These soils remain moist because of the shady microclimate, but they are inundated only during extreme high-water periods. Because soils remain moist most of the year, hardwood hammocks rarely burn, but they are susceptible to fire during extended droughts. Following a fire, the species composition of recolonized hammocks often changes significantly (Duever et al. 1986a).

Pinelands. Pinelands occur extensively within the preserve, primarily throughout the northeastern portions. South Florida slash pine (*Pinus elliotii* var. *densa*) is the major overstory species, with a dense understory of cabbage palm (*Sabal palmetto*) and saw palmetto (*Seronoa repens*) on higher, drier sites and grasses on lower, wetter locations. Pinelands occupy a variety of sites; in some areas they exist on seldom inundated sandy sites; in others they occur along pond margins, topographic depressions, and rocky areas. Generally, maximum water levels reach just to the soil surface (Klein et al. 1970). Pine needles, grasses, and other combustible materials accumulate relatively quickly in pinelands, and pinelands burn at frequent intervals. If fires are suppressed, pinelands eventually succeed to hardwood-dominated stands.

An estimated 23,500 acres of pinelands in the preserve have never been cut. These old-growth pinelands are collectively one of the largest examples of this type in south Florida.

Grazing, logging, and drainage activities have affected pinelands considerably. Prescribed fires every one to three years to improve cattle range can prevent the establishment of pine seedlings. This perpetuates the formation of palmetto prairies instead of pinelands, especially where timber harvesting has occurred. Manipulating water levels by draining lowlands can result in pine stands becoming established in areas previously occupied by cypress or other wetland vegetation. Draining drier areas may result in conditions too dry for pine establishment, and these areas also become dominated by saw palmetto. Such changes are evident in the western portion of the preserve, which is drained by the Turner River canal.

Cypress Prairies. Cypress prairies are characterized by an open forest of small cypress trees and scattered, sparse growths of grasses, sedges, and forbs. They occur on a thin layer of marl soil or sand overlying limestone. During the wet season prairies are flooded to a depth of about 8 inches, with inundation lasting 120 days. Fuel buildup is slow on these sites, and fires occur only once every decade or two (Forest Service, Wade et al. 1980a).

Marshes. Marshes in Big Cypress can be divided into freshwater and salt marshes (Forest Service, Wade et al. 1980a); freshwater marshes are more prevalent in the preserve. Both are dominated by emergent broad-leaved sedges and grasses and are inundated approximately 150-250 days per year.

Species composition of freshwater marshes varies considerably, but typically includes pickerelweed (*Pontedaria cordata*), arrowhead (*Sagittaria lancifolia*), maidencane (*Panicum hemitomon*), and sawgrass (*Cladium jamaicencis*). Freshwater marshes are generally located at elevations between cypress strands and pinelands, primarily on the slopes of the undulating bedrock surface that underlies most of the preserve. Soils tend to be shallow and organic in origin, with bedrock exposed in patches as a result of past fires. A well-developed algal mat known as periphyton often covers the soil surface, forming marl soils high in calcium carbonate and constituting an important food chain element for many insects and fish (Gleason 1974). Maximum wet season water levels are about 8 inches for these marshes. Dry surface soils are exposed during much of the dry season, resulting in frequent patchy fires, which prohibit pines and cypress from invading the quickly recovering marshes.

Salt marshes cover little of the total area in Big Cypress and may be the least understood plant community in south Florida (Forest Service, Wade et al. 1980a). Dominant species depend in part on the season and associated changes in soil water salinity. During certain seasons some species dominate and then die back, after which other species dominate (Duever et al. 1979). Thus, saline species, such as sea purslane (*Sesuvium portulacastrum*) and salt grass (*Distichlis spicata*) are found interspersed with freshwater species such as cordgrass (*Spartina spartinae*) and spike rush (*Eleocharis cellulosa*). Salt marshes are underlain by limestone, and periphyton mats form calcitic marls at depths of less than 3 feet. Water chemistry changes dramatically throughout the year. As the wet season ends, brackish water replaces fresh water, and at the peak of the dry season, water levels drop below the surface. Tides, hurricanes, and freshwater diversion also affect salinity levels in these marshes. Fires sweep through salt marshes when weather conditions and fuel loads are conducive. Without fire or frost trees would eventually replace salt marsh vegetation (Forest Service, Wade et al. 1980a).

Prairies. Prairies are treeless areas dominated by grasses and grasslike plants. Wet and dry prairies have been differentiated (Duever et al. 1979). Wet prairies are characterized by muhly grass (*Muhlenbergia capillaris*), love grass (*Eragrostic* spp.), and sand cordgrass (*Spartina bakerii*). In the southeastern portion of the preserve, sawgrass and spikerush are the dominant wet prairie species. Dry prairies are characterized by broom sedges (*Andropogon* spp.), white top sedge (*Dichromea* spp.), cordgrass, and saw palmetto. Wet prairies and marshes generally occupy the slopes of an undulating bedrock surface, with wet prairies being in higher areas than marshes. Wet prairies tend to have sandier soils than marshes, but they also occupy thin layers of marl soil over bedrock. Dry prairies occur at higher elevations on bedrock and have relatively little soil. Wet prairie types have hydroperiods of 70 days and are inundated to a maximum depth of 8 inches during the wet season; dry prairies have hydroperiods of 50 days and are inundated to a maximum of 2 inches. Like marshes, prairies will burn during periods of drought and when sufficient fuel is present. Fire maintains prairies by eliminating invading trees and shrubs.

Sloughs. Sloughs are sinuous, elongated natural drainage channels that are inundated most of the time. Dominant species are aquatic plants and include white water lily (*Nymphea odorata*), water hyssop (*Bacopa caroliniana*), and ludwigia (*Ludwigia repens*). Emergent plants are sparse, with spike rush common in some areas. Sloughs are generally a few feet to a few inches below adjacent marshes. Soils are mostly peat or muck, with submerged surface sediments rising and falling with fluctuating water levels.

During severe droughts, surface sediments dry out and ground fires may develop, but generally sloughs are wet most of the year and have historically served as fire breaks for communities bordering the sloughs. When fires do occur, depressions are formed in the organic soils, and they fill with water to become ponds. Ponds and sloughs provide important habitat for alligators.

Mangrove Forests. Mangrove communities are the least diverse terrestrial vegetation type in south Florida (Long 1974). Major species include the red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), black mangrove (*Avicennia germinans*), and buttonwood (*Conocarpus erectus*). Most of Florida's remaining mangrove forests are in Everglades and in national wildlife refuges along the coast. Those in Big Cypress are generally stunted, rarely reaching over 33 feet in height (Duever et al. 1979). The distribution of these species in the preserve depends on water depth and salinity. Mangroves cannot survive in areas that dry out, and they are found at the seaward edge of marshes only in solution holes where water contact is constant.

Air temperature, water availability, and soil fertility are the primary factors determining mangrove distribution. However, catastrophic events, such as fires, frosts, hurricanes, and oil spills, limit mangrove productivity. Fires can completely eliminate mangroves, as happened in the Ochopee area during 1976-77. Frosts severely prune mangroves, and hurricanes can destroy them by wind and wave action, and by suffocating roots with deposited sediments (Duever et al. 1979). Mangroves eventually re-invade areas where they have been damaged; accordingly, the mangrove/salt marsh interface fluctuates over the years.

Vegetation on Disturbed Sites. Areas affected by man's activities occur throughout the preserve. Logging, canal and road construction, farming and grazing, oil extraction, ORV use, and facility construction have caused many changes in vegetation communities. The encroachment of exotic species, increased fire frequency, and loss of natural vegetation are the primary repercussions of these activities.

Protected Plant Species

A total of 73 plants in Big Cypress are under review for federal protection, are protected by the Florida Department of Agriculture (FDA) or are listed by the Convention on International Trade in Endangered Species (CITES). These species are listed in tables 20 and 21. Most have ranges limited to south Florida as a result of habitat reduction caused by water management projects, urbanization, and agricultural expansion. Several are subject to illegal collecting.

Table 20: Plants under Review for Federal Protection

	Scientific Name	Common Name	Status*		Probable Habitat
			FDA	CITES	
Category I – Species under Review (listing is highly likely)	*Chamaesyce (Euphorbia) porteriana* var. *porteriana*	Porter's broom spurge	–		Pinelands
	Linum carter var. *smallii*	Flax	–		Prairies and pinelands
	Roystonea elata	Royal palm	Endangered		Hammocks and swamp forests; rare in Big Cypress
	Tripsacum floridanum	Grama grass	–		Disturbed sites and pinelands
Category 2 – Species under Review (data are being collected for possible listing)	*Brassia caudata*	Spider orchid	Threatened	Listed	Formerly extirpated in the wild; reintroduced to Big Cypress
	Elytraria caroliniensis var. *augusta*	Narrow-leaved carolina	–		Pinelands and prairies
	Eriochloa michauxii var. *simpsonii*	Longleaf cupgrass	–		Probably present in prairies in Big Cypress
	Jacquemontia curtissii	Pineland clustervine	Endangered		Pinelands
	Melanthera parvifolia	Small-leaved melanthera	–		Pinelands
	Myrcianthes frans var. *simpsonii*	Simpson's stopper	–		Tropical hammocks
	Peperomia floridana	Everglades peperomia	Endangered		Hammocks and cypress strands
	Stillingia sylvatica ssp. *tenuis*	Slender queen's delight	–		Probably present in wet pinelands and prairies in Big Cypress
Category 3 – Species Formerly under Review (not currently being considered for listing)	*Schizachyrium rhizomatum*	Florida autumngrass	–		Prairies; taxanomic status is in question
	Ophioglossum palmatum	Hand adder's-tongue fern	Endangered		Hammocks; more abundant than previously thought or nonthreatened
	Zephyranthes simpsonii	Simpson's zephyr lily	–		Pinelands; more abundant than previously thought or nonthreatened

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*Status: FDA = Florida Department of Agriculture
CITES = Convention on International Trade in Endangered Species

Table 21: Other Plants Protected by Florida or Listed by the Convention on International Trade in Endangered Species (CITES); No Federal Status

Scientific Name	Common Name	FDA	CITES
Acrostichum danaeifolium	Giant leather fern	T	
Anemia adiantifolia	Pine fern	T	
Azolla caroliniana	Mosquito fern	T	
Calopogon pallidus	Pale grass pink	T	Listed
Calopogon pulchellus	Grass pink	T	Listed
Calopogon tuberosus	Grass pink	T	Listed
Campylocentrum pachyrrhizum	Leafless orchid	E	Listed
Catopsis berteroniana	Powdery catopsis	E	
Catopsis floribunda	Air plant	E	
Chrysophyllum olivaeforme	Satinleaf	E	
Ctenitis sloanei	Comb fern	T	
Cyrtopodium punctatum	Cowhorn orchid	E	Listed
Encyclia cochleata	Shell orchid	T	Listed
Encyclia tampensis	Butterfly orchid	T	Listed
Epidendrum anceps	Dingy-flowered epidendrum	T	Listed
Epidendrum difforme	Unbelled epidendrum	T	Listed
Epidendrum rigidum	Rigid epidendrum	T	Listed
Erythrodes querceticola	Low erythrodes	T	Listed
Eulophia alta	Wild coco	T	Listed
Guzmania monostachia	Fuch's bromeliad	E	
Habenaria quinquesta	Michaux's orchid	T	Listed
Habenaria repens	Water spider orchid	T	Listed
Ionopsis utricularioides	Delicate ionopsis	E	Listed
Malaxis data	Florida malaxis	T	Listed
Maxillaria crassifolia	Hidden orchid	E	Listed
Microgramma heterophylla	Polypody fern	T	
Nephrolepsis biserrata	Boston fern	T	
Oncidium floridanum	Florida oncidium	T	Listed
Ophloglossum petiolatum	Adder's-tongue fern	T	
Osmunda regalis	Royal fern	SC	
Peperomia glabella	Cypress peperomia	E	
Phlebodium aureum	Golden polypody	T	
Platanthera nivea	Showy orchid	T	Listed
Polypodium plumula	Polypody fern	T	
Polystachya flavenscens *(concreta; extinctoria)*	Pale-flowered polystachya	T	Listed
Ponthieva racemosa	Shadow witch	T	Listed
Psilotum nudum	Whisk fern	T	
Pteris longifolia	Ladder break fern	T	
Salvinia rotundifolia	Water spangles	T	
Spiranthes cemua var. *odorata*	Fragrant ladies' tresses	T	Listed
Spiranthes vemalis	Spring ladies' tresses	T	Listed
Thelypteris interrupta	Aspidium fern	T	
Thelypteris kunthii	Aspidium fern	T	
Thelypteris ovata	Aspidium fern	T	
Thelypteris palustris	Marsh fern	T	
Thelypteris quadrangularis	Aspidium fern	T	
Tillandsia balbisiana	Wild pine	T	
Tillandsia fasciculata	Common wild pine	SC	
Tillandsia flexuosa	Twisted air plant	T	
Tillandsia paucifolia (T. circinnata)	Wild pine	T	
Tillandsia polystachia	Wild pine	T	
Tillandsia pruinosa	Fuzzy-wuzzy air plant	E	
Tillandsia setacea	Wild pine	T	
Tillandsia utriculata	Giant wild pine	SC	
Tillandsia valenzuelana	Wild pine	T	
Trichomanes holopterum	Filmy fern	T	
Vanilla phaeantha	Leafy vanilla	T	Listed
Vittaria lineata	Shoestring fern	T	

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*T = Threatened   E = Endangered   SC = Special Concern

Exotic Plant Species

Thousands of nonnative plant species have been introduced to south Florida for ornamental plantings, agriculture, and other human uses. Because of the relative youth of the south Florida landmass and the semitropical climate, it is theorized that the region is particularly susceptible to invasion by exotic plant species (Duever et al. 1986a). Some 297 exotic plants are known to have been naturalized in south Florida (Duever et al. 1986a). Many of these are reported from Big Cypress National Preserve, but most are restricted to early successional stages on disturbed sites, and only a few pose a long-term threat to native communities. Of these, five species – melaleuca (*Melaleuca quinquenervia*), Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casurina* spp.), water hyacinth (*Eichhornia crassipes*), and hydrilla (*Hydrilla verticillata*) – are fairly widespread in the preserve.

The water hyacinth and hydrilla have invaded the canal systems, where they often form dense mats. Neither plant can invade seasonally dry wetlands, and the plants appear to be restricted to permanent water in canals. For this reason no major control program is currently warranted.

Melaleuca, Brazilian pepper, and Australian pine are capable of invading native plant communities, and control efforts have been concentrated on these species. Melaleuca, a native of Australia and New Guinea, was introduced to Florida around 1910 for landscaping. Perhaps the first introduction of melaleuca in Big Cypress was at Monroe Station around 1940. Today there is a dense stand of mature trees at the site, and younger stands radiate from this seed source. Similar concentric distributions are found off the Loop Road west of Pinecrest and along US 41 from Fifty Mile Bend to Trail Center. Smaller stands are scattered around the Ochopee and Raccoon Point areas. A total of about 60 square miles (7 percent) of the preserve has been affected. Because it grows in pure stands at the expense of native plants and can occupy large areas, melaleuca is considered to be a major threat to the ecological integrity of the preserve.

Melaleuca has successfully invaded much of south Florida because of its outstanding ability to propagate. A mature tree may contain tens of thousands of small woody seed capsules along its branches, and each capsule contains about 250 seeds. The capsules remain closed as long as they receive moisture from the tree's vascular system. However, if the vascular system fails due to damage by fire, frost, cutting, herbicidal injury, or simply old age, the capsules will slowly dry out, open, and release hundreds of thousands of seeds. The seeds fall within a short distance of the parent tree and germinate best on open, moist soils. Germination is limited on very dry or very wet soils and under dense undergrowth. As a result, melaleuca does well in prairies and open, moist pinelands but is slower to invade wetter communities such as cypress domes and strands.

Melaleuca is extremely fire tolerant. The spongy inner bark insulates the trunk while the papery outer bark and oil-rich leaves readily carry fire. Following a fire melaleucas will both release seeds and resprout, and fires create excellent conditions for melaleuca seed germination and seedling survival. Hence, fire in a mature melaleuca stand can encourage the exotic to spread.

Melaleuca control has been predominantly by the "hack and squirt" method, where the trunk is notched in several places and herbicide is directly applied to the incisions. Control applications are carried out during the height of the wet and dry seasons, when seed germination is poorest. The technique is labor intensive, and trained personnel are required to handle the herbicides. Citizen volunteer groups have also assisted in melaleuca control by mechanically removing seedlings, collecting removed trees for disposal, and other work. Herbicides currently used in melaleuca control are Garlon 3A (manufactured by Dow Chemical Company) and Velpar-L (from E.I. DuPont DeNemours and Company). Once mature, seed-bearing trees have been killed, prescribed fire or cutting may then be used to control seedlings and sprouts. To date, about 3,600 acres of melaleuca infested land have been treated.

At least eight species of Australian pine were introduced to south Florida around 1900. Two species, *Casurina cunninghamia* and *C. glauca*, are currently recorded in the preserve. Both reproduce almost exclusively by root sprouts, but some reproduction by seed has been reported (NPS, Gunderson 1983a). There is a *Casurina* windrow along US 41 between Trail Center and Forty Mile Bend, and there are individuals around several homes and camps. In almost all cases the trees were intentionally planted, and stands have only slowly expanded.

Fire and long hydroperiods appear to inhibit Australian pine invasion (Duever et al. 1986a). Therefore, the trees are limited to older plantings on disturbed upland sites that are protected from fire. Although fire inhibits invasion, established Australian pines will sprout from root stock after a fire and maintain themselves on the site (NPS, Gunderson 1983a).

Australian pine does not have the potential for as rapid expansion in the preserve as does melaleuca. However, threats from established stands of Australian pine include root damage to archeological resources, windthrow hazards from roadside trees, and visual intrusion along road corridors. Complete elimination of Australian pine could be accomplished relatively easily, but limited manpower and funds have precluded a major removal program. Treatment currently involves cutting trees and direct application of Garlon 4. Approximately 43 acres in the preserve have been treated.

A native of South America, Brazilian pepper, or schinus, was first introduced to south Florida around 1900. It is now widespread in the region, primarily on disturbed, well-drained sites. In Big Cypress it is often found on old farm fields, spoil banks, and canal berms. Approximately 400 acres of the preserve have been heavily invaded, particularly in the Ochopee area, along US 41 west of Monument Lake, and on Turner River, Wagonwheel, and Birdon roads. In addition there are scattered trees around backcountry camps and other disturbed uplands in the interior of the preserve (NPS, Gunderson 1983a).

Brazilian pepper spreads by seed, root sprouts, and runners. Seeds are produced in bright red berries that are ingested by birds and other wildlife and then spread to other areas. Ingestion appears to improve seed germination potential.

Fire has variable effects on pepper plants. Seedlings are killed by fairly frequent fires; however, in more mature stands trees may be top-killed by fires but can resprout and

best copy available

reoccupy a burned area. Intense fires on upland sites tend to eliminate competing vegetation and prepare good seedbed conditions for a schinus invasion.

Unlike melaleuca, Brazilian pepper does not occur in dense, pure stands in Big Cypress, and it appears to be a successional species that is dependent on disturbance. As some upland areas mature toward hardwood hammock vegetation, pepper will decline in importance. However, in most upland areas the natural fire cycle is likely to maintain Brazilian pepper as a component of the understory indefinitely. Fire and hydrological cycles seem to prevent any invasion of undisturbed prairies, marshes, and other more moist types. About 18 acres of land infested by Brazilian pepper have been treated.

The exotic plant control program is carried out by the preserve's resource management staff. Staff personnel are active participants in the Exotic Pest Plant Council, an interagency task force organized to share technical information on control of exotics and to monitor the distribution of exotics in south Florida.

FIRE ECOLOGY AND MANAGEMENT

The natural vegetation communities of Big Cypress are not stable, but are dynamic, and boundaries of the communities shift over the years. The two major influences on vegetation distribution are hydroperiods and fires; other significant factors are frost and hurricane damage, although they are somewhat less important because they occur infrequently. Of these influences, only fire can be used as a practical management application in natural areas.

The importance of fire in the natural environment of south Florida is well documented (Forest Service, Wade et al. 1980a; NPS, Robertson 1953; Davis 1943). All natural communities in the region are affected by fire, and many not only survive periodic burning but are ultimately dependent on fire for their perpetuation. Many plants in fire-dependent communities, such as prairies and pinelands, are highly flammable, and fires spread rapidly in these communities. Ignition sources are plentiful. South Florida has the highest incidence of lightning of any region in the nation, and there is also a long history of human-caused fire (Forest Service, Wade et al. 1980a). Lightning-caused fires occur most frequently from May through September, during the late dry season, and throughout the wet season; human-caused fires can occur any time but tend to be more frequent in the dry winter months. Human-caused fires have probably been an influence on the regional vegetation for several thousand years (Duever et al. 1986a). Frequent ignition and high flammability, particularly in combination with annual dry seasons, create an extraordinarily high fire frequency, and fires in south Florida tend to be large. In fact, three national park system areas in south Florida account for more than 25 percent of all the area burned in the national park system annually (NPS, Taylor and Doren 1982j).

The effects of fires in Big Cypress are extremely complex and depend on such factors as the season, intensity, extent, and duration of burning and the susceptibility and responsiveness of vegetation to fire damage. The flammability of vegetation types varies through the annual wet and dry seasons and from year to year. For example, drier, more upland types such as pinelands and some prairies are susceptible to fire earlier in the year than most wet prairies and marshlands, which dry out as the season progresses.

However, hardwood hammocks, mixed-hardwood swamps, and cypress strands are rarely dry enough to burn except during extended droughts.

Roughly 70 percent of the preserve consists of prairies, cypress prairies, pinelands, marshes, and other communities that require periodic fire for perpetuation. In such communities surface fires tend to eliminate competing vegetation, stimulate sprouting or seed production, create seedbed conditions, and release nutrients bound up in standing plant materials. Without cyclic fire, fire-tolerant species decrease in reproduction as a site is invaded and eventually dominated by fire-intolerant plants.

Although periodic surface fires tend to maintain certain communities, extreme fire conditions can dramatically alter plant, and consequently animal, distribution. When the fire cycle is retarded, organic materials accumulate and create hazardous fuel levels that can threaten even fire-tolerant types. Prolonged droughts or artificial drainage can dry out the organic soils of many plant communities and, when coupled with hazardous fuel accumulations, can result in intense fires that consume organic soil materials. Peat fires, as such fires are called, can literally burn the soil out from under established vegetation, radically changing the plant composition. Peat fires tend to lower the surface level of the burned area, thereby extending the hydroperiod and affecting the replacement vegetation. The pond in the middle of a cypress dome, for instance, may be enlarged by a peat fire. In an extreme example, a hardwood hammock on deep organic soil may be completely consumed by fire and replaced by an open pond.

Because of the flammability of much of the vegetation in the preserve and the ready source of ignition, it would not be possible to exclude fire from the preserve, nor would it be desirbale to do so. It is the job of resource managers not simply to stop fires, but rather to attempt to control where, when, and how intensely they burn.

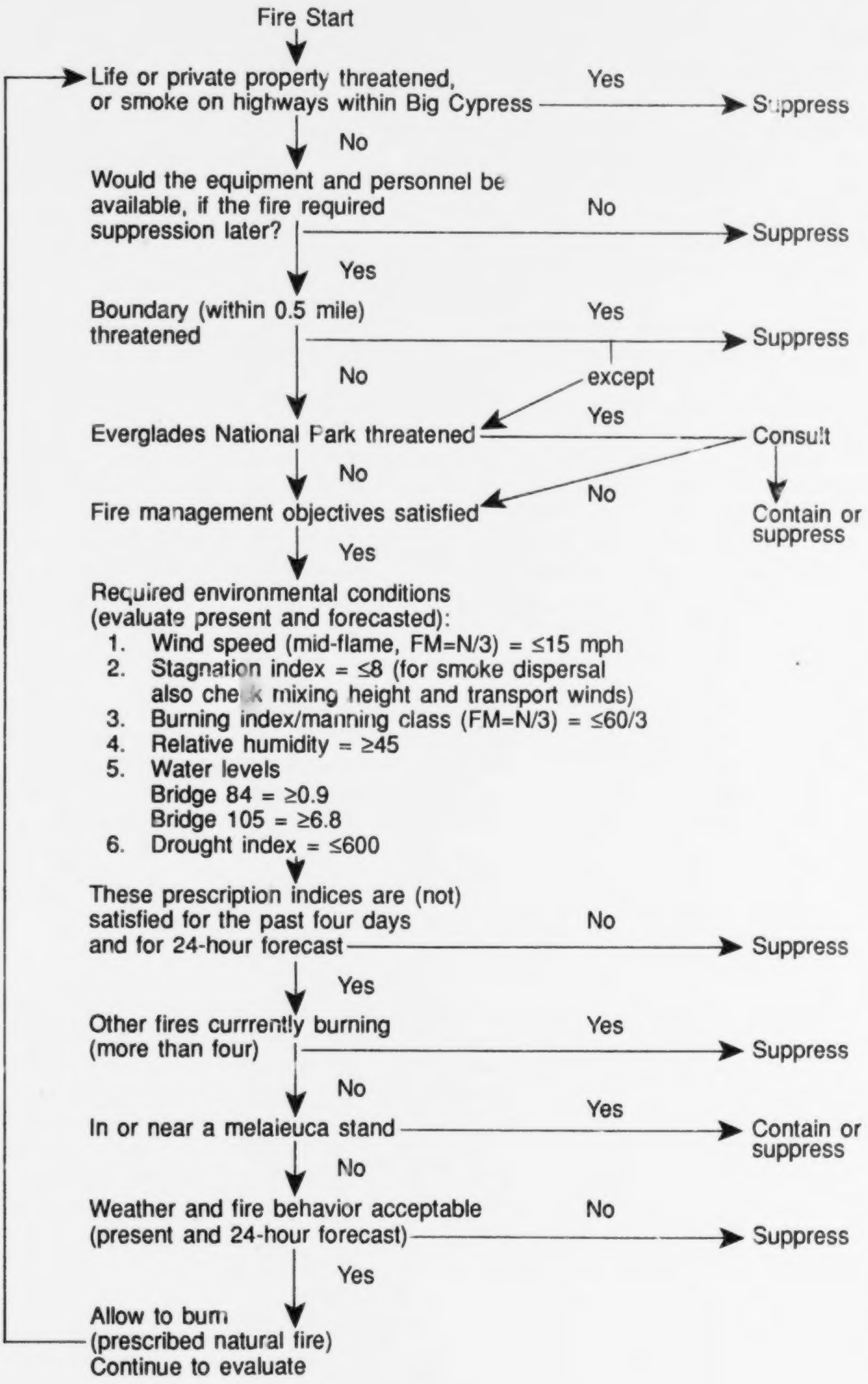
The current fire management program is based on the preserve's fire management plan. Management fires are allowed to burn under carefully controlled, prescribed conditions in order to accomplish resource objectives. Wildfires (fires that are not controlled or prescribed) are suppressed as quickly as possible, and suppression is determined by factors relating to weather, resource threats, costs, etc. (see Decision Flow Chart for Prescribed Fired).

Management fires include planned ignitions and prescribed natural fires. Planned ignitions are fires intentionally set by resource managers to meet specific objectives. Prescribed natural fires are fires that are caused by lightning or other ignition and that also happen to meet management objectives. For both planned ignitions and prescribed natural fires, burning conditions must fall within a predetermined range of relative humidities, wind speeds and directions, natural fuel loadings and fuel moisture content, potential smoke concentrations, and other factors. The location and potential size of the fire in relation to properties, exotic plant stands, and the ability to control the fire are also assessed.

The preserve's fire management plan lists five objectives for management fires in Big Cypress:

> to continue historical agricultural burning under controlled conditions, in conjunction with cattle grazing permits

DECISION FLOW CHART FOR PRESCRIBED FIRE
BIG CYPRESS NATIONAL PRESERVE


Fire Start
Life or private property threatened, or smoke on highways within Big Cypress
Yes
Suppress
No
Would the equipment and personnel be available, if the fire required suppression later?
No
Suppress
Yes
Boundary (within 0.5 mile) threatened
Yes
Suppress
except
No
Everglades National Park threatened
Yes
Consult
Contain or suppress
No
No
Fire management objectives satisfied
Yes
Required environmental conditions (evaluate present and forecasted):
1. Wind speed (mid-flame, FM=N/3) = ≤15 mph
2. Stagnation index = ≤8 (for smoke dispersal also check mixing height and transport winds)
3. Burning index/manning class (FM=N/3) = ≤60/3
4. Relative humidity = ≥45
5. Water levels
Bridge 84 = ≥0.9
Bridge 105 = ≥6.8
6. Drought index = ≤600
These prescription indices are (not) satisfied for the past four days and for 24-hour forecast
No
Suppress
Yes
Other fires currrently burning (more than four)
Yes
Suppress
No
In or near a melaleuca stand
Yes
Contain or suppress
No
Weather and fire behavior acceptable (present and 24-hour forecast)
No
Suppress
Yes
Allow to burn (prescribed natural fire) Continue to evaluate

Note: Contain by water levels, dew, and control lines. Where natural barriers are narrow or control lines weak, burnout adjacent areas for more security.

to clear land (debris burning)

to reduce fuels around critical habitats, such as hammocks, where rare or endangered species could be jeopardized by wildfire under extreme burning conditions

to test, under controlled conditions, the effectiveness of fire as a means of retarding or eliminating melaleuca invasion

to reduce unnatural accumulations of fuel from around frontcountry and backcountry developments and along all roadsides (hazard reduction)

Management fires have been used to reduce hazardous fuel accumulations around property and in historically high arson areas, to improve pasturage on grazing allotments, to maintain habitat for the Cape Sable seaside sparrow and red-cockaded woodpecker, and to research the effects of fire on prairie vegetation. Between 1980 and 1985 prescribed burning averaged 9,000 acres annually in the preserve. In the recent past burning was also used to either demolish trespass camps or to reduce the debris from demolished trespass camps; however, this practice was suspended pending litigation over removing trespass camps from the preserve. Some persons have expressed concern that previous methods of debris removal on fire-sensitive hardwood hammocks damaged mature trees and possibly archeological resources.

Fire suppression activities are concentrated between February and May each year. Wildfires or management fires exceeding prescriptions are usually suppressed. On occasion wildfires are allowed to run their course if people, properties, or natural and cultural resources are not directly threatened and suppression activities are not feasible because of the inaccessibility of the fire and limited manpower and equipment.

WILDLIFE

Protected Species

A total of 37 animals in Big Cypress receive some level of special protection or are recognized as rare species by the state of Florida, the federal government, or the Convention on International Trade in Endangered Species (see tables 22 and 23). Most of these species are limited to south Florida, and they are endangered as a result of habitat reduction caused by water management projects, urbanization, and agricultural expansion. Of the listed species, only four – the Florida panther, Cape Sable seaside sparrow, red-cockaded woodpecker, and *Liguus* tree snails – will require specific management actions to ensure their perpetuation in the preserve. The current condition for each is described below.

Table 22: Federally Listed Wildlife Species within Big Cypress National Preserve

	Scientific Name	Common Name	Status*		Remarks
			FGFWFC	CITES	
Endangered Species	*Felis concolor coryi*	Florida panther	Endangered	Listed	Less than 30 thought to remain in the wild in south Florida; in 1985 five known to be using portions of Big Cypress. Population decline due to hunting and habitat destruction. Poor reproduction and disease problems with many remaining panthers, perhaps because of insufficient prey, human disturbance, genetic deficiencies, and introduced diseases.
	Trichechus manatus latirostris	West Indian manatee	Endangered	Listed	Infrequently sighted in the lower portions of Turner River canal and Halfway Creek; no known threats in the preserve.
	Ammospiza maritima mirabilis	Cape Sable seaside sparrow	Endangered		Nests in marshes in the southern portion of preserve; periodic burning required for habitat maintenance.
	Haliaeetus leucocephalus	Bald eagle	Threatened	Listed	Three bald eagle nests in the southern portion of the preserve; no known threats in Big Cypress.
	Mycteria americana	Wood stork	Endangered		Small winter nesting colonies occasionally reported; regular use of marshes north of US 41 for feeding; no known threats in Big Cypress.
	Picoides borealis	Red-cockaded woodpecker	Threatened		Twenty-six colonies in Big Cypress in uncut, mature pinelands; periodic burning required to maintain habitat.
	Rostrhamus sociabilis	Snail kite	Endangered		No known nesting in the preserve; occasionally sighted feeding in eastern marshes; no apparent threats in Big Cypress.
	Campephilus principalis	Ivory-billed woodpecker	Endangered		Extirpated from south Florida and the rest of its former range in the continental United States.
	Canis rufus gregoryi	Red wolf			Extirpated from Florida and most of its former range in the southeastern United States.
	Crocodylus acutus	American crocodile	Endangered		Historical range includes the Ten Thousand Islands area of Everglades National Park adjoining the Stairsteps unit of Big Cypress.

	Scientific Name	Common Name	Status*		Remarks
			FGFWFC	CITES	
Threatened Species	*Falco peregrinus tundrius*	Arctic peregrine falcon	Endangered	Listed	Infrequent migrants; no apparent threats in Big Cypress.
	Alligator mississippiensis	American alligator	Species of special concern	Listed	Because of protection, relatively plentiful in Big Cypress; threatened in Florida because it looks like the endangered American crocodile.
	Drymarchon corais couperi	Eastern indigo snake	Threatened		Extremely secretive, so may be more common than thought; threatened throughout its range by illegal collecting.
Category 2 – Candidate Species (data being collected for possible listing)	*Mustela vison evergladensis*	Everglades mink	Threatened		Reported in canals and ponds; infrequent road kills but no known threats in Big Cypress.
	Sciurus niger avicenna	Mangrove fox squirrel	Threatened		Low densities, primarily occurs in pine, cypress communities; no threats to habitat in Big Cypress; some illegal hunting.
	Ursus americanus floridanus	Florida black bear			Protected from hunting in Florida since 1972; broad distribution in Big Cypress and in many habitat types; no threats to Big Cypress habitats; Some illegal hunting and road kills, but population levels appear healthy.
	Aimophila aestivalis	Bachman's sparrow			Occasionally sighted; no known threats in the preserve.
	Buteo swainsoni	Swainson's hawk	Species of special concern		Winter migrant; no known threats in Big Cypress.
	Egretta rufescens	Reddish egret	Species of special concern		Occasionally sighted; no known threats in Big Cypress.
	Elanoides forticatus	Swallow-tailed kite			Nests in cypress and pine forests; no known threats in Big Cypress.
	Falco sparverius paulus	Southeastern kestrel	Threatened		Possible winter migrant; no known threats in Big Cypress.
	Lanius ludovicianus migrans	Migrant loggerhead shrike			Possible winter migrant; no known threats in the preserve.
	Rallus longirostris insularum	Mangrove clapper rail			Possibly occurs in Big Cypress; no known threats in the preserve.

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*Status: FGFWFC = Florida Game and Fresh Water Fish Commission
CITES = Convention on International Trade in Endangered Species

Table 23: Other Wildlife Species Listed by Florida or the Convention on International Trade in Endangered Species (CITES); No Federal Status

Scientific Name	Common Name	Florida Game and Fresh Water Fish Commission*	CITES
Ajaia ajaja	Roseate spoonbill	SSC	
Aramus guarauna	Limpkin	SSC	
Centropomus undecimalis	Common snook	SSC	
Circus cyaneus	Marsh hawk or American harrier		Listed
Egretta caerulea	Little blue heron	SSC	
Egretta thula	Snowy egret	SSC	
Egretta tricolor	Tricolor or Louisiana heron	SSC	
Falco columbarius	Merlin or pigeon hawk		Listed
Falco sparverius sparverius	Eastern kestrel		Listed
Grus canadensis pratensis	Florida sandhill crane	T	Listed
Liguus	Tree snails		
Lutra canadensis	River otter		Listed
Lynx rufus	Bobcat		Listed
Pandion haliaetus	Osprey		Listed

Note: There are no known threats to any of these species in Big Cypress National Preserve.
*SSC = Species of special concern T = Threatened

Florida Panther. Florida panthers once lived throughout most of the southeastern United States, but intensive hunting of these animals as a pest species and the conversion of wildlands to agriculture have severely reduced the population. Today the only remaining confirmed population is in south Florida. Probably less than 30 individuals are left, and they are centered in and around Big Cypress, including Everglades National Park, Fakahatchee Strand State Preserve, and privately owned lands north of the preserve in Collier and Hendry counties.

Radio-tracking data collected by the Florida Game and Fresh Water Fish Commission and surveys of panther sign (e.g., tracks, droppings, and other physical evidence) conducted by the National Park Service and the game commission indicate three population centers in the Big Cypress area. One is in the Bear Island unit and adjoining private lands north of Florida 84, a second is in the Fakahatchee Strand just west of the preserve, and the third is in the Corn Dance unit.

Home ranges between the Bear Island and Fakahatchee Strand populations overlap in the Deep Lake unit. Field data, therefore, show that the Bear Island, Deep Lake, and Corn Dance units are consistently used by panthers. Evidence of panthers has been occasionally found in other areas of the preserve, but these three units appear to be the most regularly inhabited.

The panther populations exist relatively close to each other, but there are some striking differences in the condition of the panthers. For reasons that are not yet well understood, panthers in the Bear Island unit and adjoining private lands north of Alligator Alley are more abundant, heavier, and healthier than their counterparts in Fakahatchee Strand and the Corn Dance unit (Roelke et al. 1985). In fact one male panther weighed by researchers gained 20 pounds when he moved to the north side of Florida 84 from Fakahatchee Strand. From 1982 to 1985 panther sign declined noticeably in Fakahatchee Strand and the Corn Dance unit of Big Cypress, but sign did not decline in the Bear Island unit or on adjacent private lands. Recruitment – the number of young panthers surviving to adulthood – is also higher in the Bear Island area. Possible reasons for the better condition of panthers north of Florida 84 are that the area may contain a better mix of vegetation types supporting deer, that range management for cattle grazing in the area may support more deer, and that low hunting pressure on private lands may provide a refuge for both deer and panthers.

On the whole, and particularly in Fakahatchee Strand and the Corn Dance unit, the remaining panthers are not in good physical condition. A veterinary field study of panthers found that females tended to be underweight and anemic, and many of both sexes had depressed serum iron levels; were infected with gastrointestinal parasites, microscopic blood parasites, and ticks; and perhaps most importantly, showed evidence of exposure to calcivirus and a parvovirus called panleukopenia, or feline distemper. Feline distemper was probably introduced into the panther population around 1979 when the disease spread from domestic cats to bobcats. The veterinary study reports,

> either of these potential pathogens, acting independently or concurrently, especially when coupled with other environmental and nutritional stresses, could result in significant mortality in panthers under one year of age and could well be a factor responsible for the lack of recruitment of young panthers in south Florida (Roelke et al. 1985).

The lack of recruitment in the panther population is critical. The veterinary study estimated that between 1981 and 1985 juvenile panthers under two years constituted only 8 percent of the population, as compared to 37 percent to 54 percent in healthy panther populations in the western United States (Roelke et al. 1985). The lack of young means that panthers are either not successfully reproducing or young panthers are not surviving. Besides disease and nutritional stress, genetic problems brought on by isolation and inbreeding have been suggested as factors in declining recruitment. There is some evidence of low fertility in panthers, but it is unclear if this situation is normal or related to genetic deficiencies (Roelke et al. 1985). In 1987 there was some encouraging news concerning panther recruitment when game commission researchers documented the birth of three panther kittens in the Bear Island unit.

The automobile is the most frequent direct cause of panther deaths. Between 1981 and 1986 there were 12 documented panther deaths or injuries in south Florida, and half were road kills. Of these, four panthers were struck by cars on Florida 84 between mile-markers 16 and 18; one was hit on Florida 29 near Copeland; and one was hit on US 41 near Turner River Road. Because of the threat to panthers from automobiles, the state has designed special underpasses in constructing I-75 across Big Cypress in order to provide for safer panther movements. Other deaths included three panthers that were illegally shot, one that apparently died of drug overdose during attempted capture for research, one that was presumably killed by another panther, and one that died of unknown causes. The number of panthers dying from other causes (that is, disease) is unknown.

Several government agencies and advisory groups are involved in panther management and research in south Florida and Big Cypress. Under the Endangered Species Act, the U.S. Fish and Wildlife Service (USFWS) has oversight responsibility to review the actions of other agencies in relation to federally protected species and to establish species recovery programs. The National Park Service has the primary responsibility for protecting the Florida panther (as well as other listed species) on lands under its jurisdiction. The Florida Game and Fresh Water Fish Commission is responsible for implementing the USFWS panther recovery plan, and the National Park Service and the commission cooperate for overall wildlife management in Big Cypress. The Florida Panther Technical Advisory Council, a board of recognized experts appointed by the governor of Florida, advises the game commission on panther management. In 1986 the Florida Panther Interagency Committee was established to coordinate state and federal recovery efforts. The interagency committee includes the National Park Service, the U.S. Fish and Wildlife Service, the Florida Game and Fresh Water Fish Commission, and the Florida Department of Natural Resources.

As mentioned earlier, both the National Park Service and the Florida Game and Fresh Water Fish Commission are involved in panther research in Big Cypress. To date, NPS efforts have concentrated on the distribution of panthers on NPS lands in the preserve and Everglades National Park. The panther recovery program, under the auspices of the game commission and supported by the U.S. Fish and Wildlife Service, has focused on panther home ranges and movement patterns, physical condition and health, and breeding in captivity. In addition, the game commission has also been involved in studies of the condition and health of deer in the preserve as the panthers' main prey.

The Game and Fresh Water Fish Commission has taken steps to reduce hunting pressure in Big Cypress and to enforce speed limits to reduce panther road kills. Hunting regulation changes for the 1985-86 season eliminated the use of ATVs for hunting, limited the use of dogs to the first nine days of the hunting season, and reduced the number of quota permits for hunters during the first nine days of the season. Several game enforcement personnel have been trained in the use of radar equipment and have been involved in speed limit enforcement on Florida 84 and US 41.

NPS involvement in panther management has been primarily through the enforcement of state game regulations on preserve lands. Other actions taken to protect panthers include closure of the Eleven Mile Road to ORV use.

In preparing the draft general management plan for Big Cypress each of the agencies involved with management of the Florida panther was consulted as to management and research needs. (These agencies, under the direction of the U.S. Fish and Wildlife Service, have prepared the *Florida Panther Revised Recovery Plan* [1987a].) The consensus was that panther recruitment is critical, and most agencies agreed about the following course of action:

> Reduce hunting pressure on deer and hogs because they are panther prey species.
>
> Improve habitat by using prescribed burns and habitat manipulation to increase deer browse.

Regulate ORV use more closely because of potential disturbance to panther habitat.

Consider reintroducing panthers bred in captivity.

Continue and expand research on panther distribution, behavior, and health and on prey species status.

These actions are consistent with the recovery plan.

Cape Sable Seaside Sparrow. The Cape Sable seaside sparrow is a localized subspecies of the seaside sparrow, which is found in marshes along the Atlantic and Gulf coasts from Massachusetts to Texas. The subspecies (*Ammospiza maritima mirabilis*) is limited to marshes and prairies in extreme southern Florida.

Of the four known subpopulations of this species, two are in Big Cypress. Of the two, the subpopulation in the southeastern marshes of the preserve seems to be doing well, but the subpopulation in the Ochopee area has declined considerably. The apparent reason for the decline is vegetative changes in the marshes that have been attributed to increased sanity and fire frequency (NPS, Kushlan et al. 1982b). Although the cause has not been fully investigated, past drainage canal construction and filling for residential and commercial development at Ochopee may have altered the hydrology of the adjacent marshlands.

Cape Sable sparrows require treeless marshes and prairies for nesting and foraging. The birds have been observed in areas dominated by muhly grass (*Muhlenbergia filipes*) and to a lesser extent cordgrass (*Spartina* spp.) (NPS, Bass and Kushlan 1982h). Local populations rapidly decline once the habitat is invaded by shrubs or trees (NPS, Kushlan et al. 1982b). Treeless vegetation types depend on periodic fire for their maintenance; consequently, the sparrow population is also fire-dependent. At one Cape Sable seaside sparrow site in Everglades National Park, researchers found that sparrow numbers grew for up to three years after a fire, then they began to decrease as the vegetation density increased, with the birds disappearing from the site six years after the fire (Werner 1976).

Although fire is necessary to maintain the habitat, it must occur at the right season, intensity, and frequency to support the sparrows. Nests, eggs, newly fledged young, and even adult sparrows may be destroyed by fires in the spring or early summer during the nesting and post-nesting season. The *Cape Sable Seaside Sparrow Recovery Plan* (USFWS 1982) recommends that burning occur only in the wet season, that fires be a mosaic of burned and unburned patches, and that burning be done on a five- to 10-year rotation, depending on the vegetation type and density (see the proposed action for the Cape Sable seaside sparrow). At this time no unified program for Cape Sable seaside sparrow management has been implemented. Some burning for sparrow habitat has been done in the Ten Mile Corner section of the Stairsteps unit. An intensive survey of sparrow habitat was conducted in 1981 (NPS, Bass and Kushlan 1982h), but there is no consistent monitoring program.

Red-Cockaded Woodpecker. The red-cockaded woodpecker's historical range included most of the southeastern United States. The woodpecker is still widely distributed in the region, but the few remaining colonies (sets of cavity trees used by a particular group of birds) are confined to disjunct refuges. The population in the preserve is the southernmost and perhaps the largest in south Florida (NPS, Patterson and Robertson 1981b). The red-cockaded woodpecker can only survive in mature pine stands, usually 60 years old or more, that are infected with red-heart disease, a fungus that weakens the interior "heartwood" of a pine. This allows the birds to excavate cavities for roosting and nesting. The pine trees must be widely spaced and preferably have an open understory. Such stands are uneconomical from a forest products perspective, and most mature pinelands in the Southeast have been converted to plantations of young pines for the pulp and lumber industries, thus removing most woodpecker habitat (Lennartz et al. 1983) and causing population decline.

Beyond direct removal of mature pinelands, the woodpecker may also decline if remaining mature pinelands are not properly managed. The open understory is commonly maintained by periodic fire. However, if fires are too frequent, then the pine reproduction necessary to perpetuate the stand may be suppressed; if fires are not frequent enough, the understory may become too dense to maintain the colony, or the fuel build-up may cause an intense fire that could destroy cavity trees (NPS, Patterson and Robertson 1981b).

In prime habitat the forage area for the red-cockaded woodpecker surrounds the colony and consists of pine forests. But in Big Cypress, where pine forests are patchy, the forage area is large and includes prairies, swamps, and other vegetation communities. Recent studies show that forage areas in south Florida average over 360 acres rather than 200 acres typical for most of the woodpecker's range (Nesbitt et al. 1983).

The red-cockaded woodpecker appears to be fairly tolerant of human activities as long as the colony is maintained. For instance, several active colonies in Big Cypress are near ORV trails, oil pads, and backcountry camps. There appears to be a limit, however, on the amount or types of activities that woodpeckers will tolerate; in other parts of the South, nesting failures have been attributed to noise from loud radio music and house construction, continuous chainsaw operation, and heavy interstate traffic (Jackson 1983).

There are 24 active colonies in the preserve. Based on potential habitat, it was estimated that the preserve as a whole may contain 40 colonies (NPS, Patterson and Robertson 1981b). A sample of the known colony sites is monitored each year during the breeding season by the Florida Game and Fresh Water Fish Commission to determine the status of the colonies.

Management of the red-cockaded woodpecker in the preserve currently consists of prescribed burning, or allowing prescribed natural fire in mature pine stands known to support colonies, and restricting oil and gas activity to avoid disturbing colonies. Resource management personnel from the National Park Service and the Florida Game and Fresh Water Fish Commission consult to determine where and when burns are needed. Oil and gas activity is prohibited within the immediate vicinity of a colony in order to provide an undisturbed forage area around the colony. Management efforts to date have successfully protected the woodpecker in the preserve.

***Liguus* Tree Snails.** *Liguus* tree snails live on hammocks, primarily on smooth-barked tropical hardwood species, especially wild tamarind. The snails are best known from hammocks in the eastern portion of Big Cypress near Pinecrest and the Jetport, but populations have been reported in other areas of the preserve as well (Duever et al. 1986a) and are also found in other areas of south Florida, including the Keys.

Tree snails are varieties of the species *Liguus fasciatus*, listed as a species of special concern by the state of Florida. There are eight subspecies and about 60 varieties. The great diversity of snails is caused by genetic isolation of each population on tree islands or in clusters of tree islands. The most obvious result of genetic isolation is the variation in shell coloration and markings. The colorful patterns, variety, and rareness of the shells has made them highly collectible. During the 1984-85 season, 110 collectors harvested 2,880 live tree snails in the preserve.

The primary threat to *Liguus* tree snails is habitat destruction. Many hammocks have been destroyed by commercial and residential development in southeastern Florida, and recent expanded development in the Florida Keys is a continuing problem. Destruction of hammocks by catastrophic fire is more of a threat in a natural area such as Big Cypress. Hammocks rarely burn under natural conditions, but they can be completely eliminated if fuel levels are artificially high as a result of past fire suppression or reduced hydroperiods from altered drainage. Fires that prune the edges of hammocks may enhance snail habitat by encouraging vegetative growth, but hot fires within hammocks can kill hardwoods and remove snail populations.

Overcollecting has also been identified as a threat to tree snails (Pilbry 1946), but it is unclear whether collecting alone can adversely affect a population. Tree snails are believed to have a high reproduction potential, and under normal circumstances they appear to be resilient even to heavy collecting. However, an incident has been reported from another area of south Florida where the partial destruction of a hammock caused a flurry of collecting because the collectors feared losing the color form; ironically, the intense collecting decimated the already stressed snail population (Archy Jones, personal communication 1985).

Collecting may also threaten the genetic variety within the species. In the past, some irresponsible collectors have transferred color varieties of snails from one hammock to another, thereby mixing varieties and diluting the natural genetic diversity which is a primary characteristic of *Liguus fasciatus*. Similarly, tree snails have been introduced into unoccupied hammocks, confounding the natural distribution of the snails.

Liguus tree snail collecting is currently banned by the state outside the national preserve. The Florida Game and Fresh Water Fish Commission is studying snail collecting to gather data for future regulations. The state has deferred the regulation of collecting within the preserve by recognizing NPS regulations (36 CFR 7.86). The National Park Service has recently established a moratorium on snail collecting within the preserve so that research can be conducted to determine the impacts of collecting. Prior to the moratorium the Park Service charged a small fee for a collecting permit and required snail collectors to return a data sheet quantifying their collecting activities in the preserve. Collectors were requested to limit collecting to no more than 10 shells of any color form per day. Transferring snail color forms between hammocks was prohibited.

Other potential threats to tree snails include predation by exotic animals, particularly wild hogs, armadillos, and rodents. The extent of predation is unknown but does not appear to be significant. Outside the preserve, pesticide broadcast spraying has severely reduced some snail populations (Duever et al. 1986a).

White-tailed Deer and European Feral Hogs

Of the 13 game species in Big Cypress, white-tailed deer and European feral hogs require special management consideration because of their importance to both recreational hunters and the endangered Florida panther. The current status of deer and hogs and proposed habitat management and research are described below.

White-tailed Deer. There have been few systematic studies of white-tailed deer in Big Cypress, and remarkably little is known about the herd within the preserve. To gain more insight, the Florida Game and Fresh Water Fish Commission initiated data collection in 1984 to estimate the population size and assess the health and condition of the Big Cypress deer (Forrester and Roelke 1985a). Even though the sampling sizes have been low and results are tentative, the investigations give the best available picture of the herd. The study has concentrated on the Bear Island unit and the Raccoon Point area of the Corn Dance unit. Table 24 compares some of the findings.

Table 24: Comparison of Deer Conditions between the Bear Island and Raccoon Point Areas

	Bear Island	Raccoon Point
Estimated density (deer per acre)	1 deer/51–79 ac	1 deer/254 ac
Average weight (mean of mean per age group)	72.5 lbs.	61.5 lbs.
Condition index	Fair-good	Fair
Parasites (abomasal parasite counts)	250-1,100	600-1,500
Sex ratio (male/female)	1/3.1	1/5.4
Reproduction potential (mean number of fetuses per pregnant doe)	1.4	1.0
Percentage of deer with antibodies for bluetongue and epizootic hemorrhagic disease vires	100	16

Source: Forrester and Roelke 1985a.

The most significant finding to date is the difference between deer herds in Raccoon Point and Bear Island, which are only 29 miles apart. In most respects the Bear Island deer were in better physical shape than the deer in Raccoon Point. Deer in Bear Island weighed 15 percent more than those in Raccoon Point, even though bone measurements showed similar skeleton sizes. Raccoon Point deer had considerably more parasites and overall were in poorer condition than their Bear Island counterparts. The high numbers of parasites, poorer overall condition, and low reproduction potential indicates that the Raccoon Point herd is beyond the carrying capacity of the habitat, but this temperate-region interpretation may not be valid in subtropical Florida (Downing et al. 1986). By the same interpretation, the healthy condition of the Bear Island herd indicates the carrying capacity in this area has not been reached, even though deer are about four times more densely distributed here than in Raccoon Point.

The reasons for the differences between the two herds have not been determined, but there are obvious differences in habitats and human use patterns between the two areas. Habitat quality is probably the most important factor. In his classic study of deer habitat in south Florida, Harlow (FGFWFC 1959a) rated habitat types based on diversity of plant species available and the degree of utilization by deer. In descending order of importance, the following habitat types are found in Big Cypress: hammocks, swamps, freshwater marshes, pinelands, and prairies. The Bear Island unit is a complex mosaic of vegetation that abounds in the first four types. Raccoon Point consists of pinelands and prairies, the least productive habitat types, with scattered cypress domes.

Bear Island not only has more diverse natural habitat, but it also has a long history of habitat manipulation for grazing, which benefits deer. Generally, deer browse in south Florida is poor because of low fertility and low palatability (FGFWFC, Harlow 1959a). In the later stages of plant succession woody plants and graminoids, which tend to be high in lignin and low in nutrition, occupy a site. Consequently, deer browse declines as the vegetation matures. The best deer browse occurs after disturbances that encourage new growth because young shoots are relatively high in nutritional value and much more palatable. Pinelands and some freshwater marshes in Bear Island have been frequently burned to improve pasturage for cattle, and this disturbance has also improved deer habitat. Grazing may also improve soil fertility. Grazing lessees provide feeding stations for cattle to nutritionally supplement the natural range. Although deer do not directly use feeding stations, it is possible that some essential microelements may be introduced into browse plants through cattle manure.

Cattle may also influence deer in a negative way. As shown in table 24, 100 percent of the deer in Bear Island show evidence of infection with bluetongue and epizootic hemorrhagic diseases, and lower but significant frequencies of leptospirosis and parainfluenza were also found, probably because of the close association between cattle and deer. Researchers speculate that these diseases may be keeping the deer herd below carrying capacity in Bear Island (Forrester and Roelke 1985b). By contrast only 16 percent of the Raccoon Point deer, which are not affected by grazing, had antibodies for bluetongue and hemorrhagic diseases, indicating low exposure.

Hunting pressure on deer in Raccoon Point and Bear Island is difficult to estimate because statistics specific to the Raccoon Point area are unavailable; use figures for Raccoon Point are incorporated in the figures for the much larger Monument unit. During the 1984-85 general gun season (prior to restrictions on ATVs and hunting dogs) a total of 1,901 hunters were known to be in the 38,000-acre Bear Island unit (one hunter per 20 acres) and only 664 hunters in the 284,000-acre Monument unit (one hunter per 428 acres; FGFWFC 1985a). Therefore, hunting is much more intense in the Bear Island unit. Methods of hunting are different for each unit. Hunting dogs are permitted in the Monument unit but not in Bear Island. The Bear Island unit has an established network of roads and trails and is easily accessible by ORVs; whereas the Raccoon Point area is much more isolated, and access is more difficult. Consequently, it appears that hunting pressure is much greater on the Bear Island deer population than the Raccoon Point population, although the use of dogs at Raccoon Point may tend to moderate the difference.

Both Bear Island and Raccoon Point support resident Florida panthers that prey on deer, but the effect of panther predation on deer herds is unknown. McBride (1985) suggests a comparison with western cougar predation on mule deer. Ackerman (1982) found that a cougar in Utah killed a mule deer about each 9.5 days, which equates to 39 mule deer per year per cougar. Although it is difficult to directly compare kill rates by panthers in Utah with Florida panthers, the scale of predation (e.g., tens of deer per year per panther) may be appropriate where deer are abundant. If this level of predation on deer is a valid assumption, then Florida panthers and hunters may be competing for the same deer. Studies of Florida panther stomach and fecal contents show wild hogs, rabbits, armadillos, and other small game are also preyed upon, but it is not clear if these prey are preferred or if panthers are forced to prey on smaller game because deer are lacking. If deer are the preferred prey, as is generally thought, then predation probably exerts a significant influence on the deer population. In fact, the Deer Management Review Panel speculated that either panthers or illegal hunters may be responsible for the unusually high mortality in older does in Bear Island and Raccoon Point (Downing et al. 1986).

Both Bear Island and Raccoon Point have active oil fields, and this factor could also affect deer. Disturbance to deer is probably low because deer readily adjust to consistent human activity. Therefore, it appears that the current level of oil and gas production has little effect on Raccoon Point or Bear Island deer populations.

In summary, habitat quality is probably the greatest determinant of deer status in comparing the Bear Island and Raccoon Point herds. Bear Island has relatively high quality habitat, which has been further enhanced by extensive prescribed burning for cattle grazing. Diseases transmitted from cattle to deer may be suppressing the Bear Island population. The Raccoon Point area has relatively poor habitat, and low hunting pressure. The use of hunting dogs in the Raccoon Point area may influence the herd. The influence of hunting and panther predation on both herds is difficult to assess. At current levels, legal hunting does not seem to be a threat to deer populations in the units, but the cumulative effect of legal and illegal hunting and of panther predation is unclear.

Extrapolating the Bear Island and Raccoon Point studies to the rest of the preserve is useful in determining the status of deer. Judging from the distribution of vegetation in the preserve, Bear Island probably has the best deer habitat available, and the estimated density of one deer per 65 acres is likely the upper limit of deer density in Big Cypress. Based on the same factors, the pine and cypress prairies of Raccoon Point seem to be poor habitat, and therefore, a density of one deer per 250 acres may be near the lower end of deer density in the preserve. The bottom of the scale is probably found in prairies. Harlow (FGFWFC 1959a) estimated that extensive prairies, without the benefit of islands of cover provided by hammocks or swamps, would support less than one deer per 1,000 acres.

Hunting statistics by the Florida Game and Fresh Water Fish Commission are also a useful tool for estimating deer populations. Statistics for the 1984-85 hunting season show the following:

Bear Island unit – one deer harvested per 1,368 acres

Stairsteps unit – one deer harvested per 1,800 acres

Loop unit – one deer harvested per 2,648 acres

Monument unit – one deer harvested per 3,638 acres

Deep Lake unit – zero deer harvested per 48,400 acres

Except for the Deep Lake unit, this ranking seems to parallel habitat quality for each unit. As described above, Bear Island has the most diverse and the greatest concentration of high-quality deer habitat in the preserve. The second-ranked Stairsteps unit has a concentration of freshwater marshes and hammocks similar to those in conservation area 3, where Harlow (FGFWFC 1959a) estimated a density of one deer per 107 acres. The remainder of the Stairsteps unit includes broad swamps and strands divided by narrow prairies, making for fairly good deer habitat in total. The quality of habitat in the Loop unit is rated as intermediate, with large tracts of cypress prairie (poor habitat) as well as hardwood hammocks, swamps, and strands (more suitable habitat). The Monument unit, as described previously, has been divided into the Turner River and Corn Dance units. The new units are similar in that they are primarily made up of pinelands and prairies interspersed with cypress strands. Consequently, habitat conditions in the Turner River and Corn Dance units probably range from intermediate to poor. The Deep Lake unit appears to be similar to the Loop unit in deer habitat. The northern portion of the unit is a mix of hardwood hammocks, strands, and freshwater marsh, which are all good habitat; the central and southern portions have extensive prairies cut by swamps and strands. Consequently, habitat for deer should be intermediate to good, but in actuality few deer are found here. Management officials believe that the Deep Lake unit is subject to heavy illegal and unchecked deer harvests, which may have heavily depleted the area. A contributing factor is the easy, uncontrolled access to the unit from Florida 29, Florida 84, Turner River Road, and Wagonwheel Road.

European Feral Hogs. Feral hogs are second to deer in importance as game animals. European hogs were first introduced to Florida by Spanish explorers in the 16th century. In more recent years feral hogs have been managed by the state as a game animal and have been stocked in many areas of south Florida, including Big Cypress as late as 1975, to improve hunting. Illegal stocking of feral hogs in Big Cypress may also occur.

Very little has been published on the biology of feral hogs in south Florida. The Florida Game and Fresh Water Fish Commission studied the dispersal and survival of stocked hogs released in the sawgrass and hammock vegetation of conservation area 3 (Schortemeyer et al. 1985). Most hogs tended to move less than 7 miles from the initial contact site. Hunting mortality was high, accounting for 38 percent of the hogs that were tracked by radio-collar. This indicates that hog populations are very susceptible to hunting pressure.

Schortemeyer, an experienced game manager in the region, estimates that mast-producing hardwood hammocks are probably the preferred habitat for hogs, followed by pinelands (because of their short hydroperiod), and during the dry season mixed-hardwood swamps. Belden et al. (1985) found that hogs tend to move into wetter vegetation types as the dry season progresses. As with deer, cypress prairies and prairies are probably the least productive vegetation for hogs (Schortemeyer, personal communication 1986).

In fact, hog harvest figures for the 1984-85 season parallel figures for deer, indicating that Bear Island has the highest hog densities, followed by the Stairsteps, Loop, and Monument units. As with deer, the Deep Lake unit is notable for the lack of legally harvested hogs, possibly due to illegal and unchecked harvesting.

Wild hogs are known for their ability to rapidly reproduce. The U.S. Fish and Wildlife Service reports that in the Merritt Island National Wildlife Refuge near Cape Canaveral hogs may produce 1.5 litters per year, with an average of 2.3 piglets at weaning (Hight, personal communication 1986). These numbers could be higher for subtropical south Florida; however, the summer wet season may be a limiting factor for hog populations. Schortemeyer has observed hogs freely moving through 1 foot of water or less, but when water is deeper than 16 inches, their movement appears to be greatly restricted, confining the animals to higher ground and limiting available space and food (Schortemeyer et al. 1985). Conversely, a prolonged winter drought appears to reduce hog reproduction and may cause direct mortality through dehydration (Schortemeyer, personal communication 1986). Given these limits, the hog population in the preserve may be constrained from large or rapid increases by environmental conditions.

In addition to being a popular game animal, feral hogs are a prey species for Florida panthers. An analysis of panther feces collected in the preserve showed that 15 percent of the samples contained hog remains (FGFWFC, Belden 1984). The report cautioned, however, that the sample may have contained both panther and bobcat scats, which would probably lower the importance of hog remains in the analysis.

Some concerns have been raised about the impact of hogs as an exotic species on natural and cultural resources in the preserve. Hogs are known to uproot extensive areas in hardwood hammocks, and this activity could pose a threat to native plants, *Liguus* tree snail eggs, and archeological resources. Rooting could encourage exotic plants by providing disturbed areas necessary for establishment. However, it has also been suggested that rooting exposes grubs and other foods for turkey, quail, and additional native wildlife and encourages browse plants for deer. Rooting also occurs during the dry season in marshes. Actual impacts have not been studied and are unknown.

Other hog-related problems include diseases carried by hogs, possible competition between hogs and native wildlife, possible adverse effects on wild turkey nesting, and competition with deer for the annual mast crop (Beckwith 1965); however, negative impacts from competition have not been quantified or confirmed. Hogs are known to be carriers of brucellosis, a disease that infects humans and could infect the Florida panther.

Management Recommendations. Several recommendations have been made for deer and hog management. The National Park Service assembled a Deer Management Review Panel of four wildlife management specialists, who determined that the preserve deer population does not appear to be threatened by legal hunting. The panel's final report recommended better controls on hunting to improve the accuracy of harvest figures, increased prescribed burning to improve deer habitat, expanded studies of deer health and population status, radio-tracking of deer for habitat use and movement information, investigation of the causes and levels of deer mortality other than legal hunting, and development of a predictive model of the deer population. The panel further recommended that half of the Bear Island unit be closed to hunting for at least five years to assess the impacts of hunting on deer, hogs, and panthers and that a long-term, comprehensive study of all panther prey species be undertaken. Such a study, the panel advised, should focus on deer, but it should also determine the role of wild hogs and small game as panther prey (Downing et al. 1986).

Similar recommendations have been made in the context of managing deer and hogs for Florida panther prey. The Florida Panther Technical Advisory Council and the U.S. Fish and Wildlife Service both advised that hunting should be reduced, prescribed burning increased for improved habitat, experimental deer food plots established on abandoned oil pads or other disturbed sites, and research on deer and hogs expanded for a better understanding of their relationship to panthers and for better management. The Florida state historic preservation officer has recommended the reduction of feral hogs in the preserve because of rooting, which can damage archeological resources and encourage exotic plant invasion of cultural sites.

Exotic Animal Species

Over 100 exotic animals have been introduced into south Florida (Duever et al. 1986a). Sixty of these are believed to be breeding populations. At least 22 exotic species have been collected in Big Cypress, 18 of which are known to be breeding populations (see table 25). Important exotics are briefly discussed below.

European feral hogs have probably the greatest impact of any exotics on native species, as previously discussed.

Armadillos are widespread in the preserve, and their burrowing activity is considered a threat to some archeological resources (see "Cultural Resources"). Armadillos are also alternative prey for the panther, and in one study they amounted to 7 percent of the panther's diet. The exotic versus native status of the armadillo is unclear. Armadillos have greatly expanded their distribution in recent times, apparently because favorable habitat has been created along road corridors and by other human-induced environmental changes; consequently, they may have become established in south Florida through this "semi-natural" range expansion. Whether armadillos are considered exotic or a new native species, they are thoroughly naturalized in the preserve and would be very difficult to eliminate.

The other exotic mammals listed in table 25 have limited distribution in the preserve, and apparently none has a significant influence on native species. The same is true of the listed exotic birds, reptiles, and amphibians.

The four exotic fish species listed in table 25 have escaped from aquariums and fish farms. The most widespread is the walking catfish which, since first reported in the preserve in 1977, has expanded its range from roadside canals into some wetland habitats (Loftus and Kushlan 1986). Its relative success is due to its ability to take oxygen from the air, so it can withstand the poor water quality conditions (for example, low dissolved oxygen, high temperatures) in shallow, temporarily flooded wetlands. Walking catfish populations are concentrated in permanent water in the dry season and disperse to marshes, sloughs, and other wetlands during the summer wet season. Unlike the walking catfish, black acara, spotted tilapia, and oscar appear to be intolerant of seasonal drought conditions and are incapable of invading wetlands that are only seasonally flooded. These fish are consequently restricted to the canal system and some connecting cypress strands with permanent water.

The effect of the four exotic fish on native species is not well understood. Exotic fish may compete with natives for habitat and feed on native species, but the exotic fish are in turn preyed upon by native wading birds and other wildlife. Exotic fish populations appear to still be expanding in the preserve, but ultimately an equilibrium will be reached. The effect on native populations is unknown, but it is likely that exotics will dominate fish populations in the canal system and in strands with permanent water connecting to the canal system. Walking catfish will probably continue to expand into wetlands during the wet season and concentrate in permanent water holes in the dry season. No practical, species-specific control method has yet been found to deal with exotic fish (Loftus, personal communication 1986). The U.S. Fish and Wildlife Service and the Florida Game and Fresh Water Fish Commission are each investigating control methods.

Fire ants entered Big Cypress in the 1970s. The ants require dry, open ground that receives full sunlight, so habitat is restricted to disturbed areas in the preserve. Fire ants are not a threat to natural systems, but they are pests around residences, campgrounds, picnic areas, maintenance yards, and other developed areas. The ants construct mounds, and if disturbed, they attack with painful stings that can cause allergic reactions in some people.

Lovebugs also entered the preserve in the 1970s. The insects are not a threat to natural systems but are a nuisance in May and again in September each year during their mating flights. Lovebugs are attracted to car exhaust and converge on roads en masse, causing clogged radiators and bug-covered windshields. Lovebug populations are expected to decline as the population reaches equilibrium. No management options have been identified to control the insect.

Table 25: Exotic Animals Reported from Big Cypress National Preserve

Mammals	**Scientific Name**	**Breeding Population**
Feral cow	*Bos taurus*	*
Armadillo	*Dasypus novemcinctus*	*
Feral cat	*Felis domesticus*	*
Jaguarundi	*Felis yagouaroundi*	
House mouse	*Mus musculus*	*
Norway rat	*Rattus norvegicus*	*
Black rat	*Rattus rattus*	*
Wild hog	*Sus scrofa*	*
Red fox	*Vulpes fulva*	
Birds		
Rock dove	*Columbia livia*	
House sparrow	*Passer domesticus*	*
Starling	*Sturnis vulgaris*	*
Reptiles		
Cuban brown anole	*Anolis sagrei sagrei*	*
Caiman	*Caiman sclerops*	*
Mediterranean gecko	*Hemidactylus turcicus turcicus*	*
Amphibians		
Cuban tree frog	*Hyla septentrionalis*	*
Fish		
Oscar	*Astropotus ocellatus*	*
Black acara	*Cichlasoma bimaculatum*	*
Walking catfish	*Clarias batrachus*	*
Spotted tilapia	*Tilapia mariae*	*
Invertebrates		
Lovebug	*Plecia nearctica*	*
Imported fire ant	*Solenopsis saevissima richteri*	*

Sources: Duever et al. 1986a; Loftus and Kushlan 1986.

CULTURAL RESOURCES

ARCHEOLOGICAL RESOURCES

In compliance with Executive Order 11593, the NPS Southeast Archeological Center has conducted five field seasons of archeological survey within the preserve. An archeological synthesis of this fieldwork is currently being prepared. A total of 395 sites were located. Many of these sites are multi-component, containing more than one discrete cultural occupation. The Archaic period (before 2000 B.C.) is represented by one site, the Glades (2000 B.C. – A.D. 1800) by 283 components, and the Archaic and Seminole occupation by 116. A general prehistoric designation has been assigned to 44 components because of a lack of diagnostic data, six were assigned to the historic American period, and seven sites remain undetermined chronologically.

The sites were located by four different methods: aerial photographic interpretation, data from informants, field investigation by the survey team, and the acquisition of site information from published maps. Sites identified include black earth middens, sand mounds, aboriginal burial mounds, shell works and middens, rock middens, rock mounds, and transient camps.

Sites are generally situated on the drier hammocks along deep sloughs and marshes. These hammocks provided dry living areas and were accessible to a network of canoe trails through the glades. There is a substantial difference in the location of site types with regards to water sources. The larger habitation sites are primarily along rivers, strands, sloughs, and ponds. These more permanent settlements required deep, drought-proof water sources. The more temporary sites would not have had this same requirement and could therefore be in areas with more marginal water resources, such as prairies, marshes, and other wetlands. Black earth middens may have been built to enlarge campsites and raise them above water level. Smaller midden sites are found most frequently in the interior, where briefer occupations and less frequent use may have been a result of seasonal use.

Tools were usually made of shell, bone, or wood because stone sources were scarce. Pottery was present by A.D. 300, even though no known source of clay exists within the glades. The prehistoric Indians modified the landscape in other ways as well. They made canals or improved natural waterways, and they may have burned the grass from time to time to drive game or keep vegetation at a manageable level for foot travel.

Current evidence suggests that Big Cypress was used year-round in a transitory hunting and gathering pattern and that agriculture was only practiced minimally. Perhaps agriculture was insignificant because of the rich plant, fish, and animal products that were available. Land animals and seafood were the primary protein food sources. Mounds of discarded shells accumulated where shellfish were processed and eaten.

The existence of burial and temple mounds and similar pottery styles indicate that the people of Big Cypress were influenced by other, more highly developed cultures in the Southeast. The culture in Big Cypress was not as highly developed or as complex as these other cultures, possibly because these people relied on wild food sources rather than agriculture. Food sources, especially shellfish, were not easily preserved and stored for later use; consequently, there may have been no need to develop large, elaborate, permanent settlements.

The Glades period had a larger number of people than was ever before seen within Big Cypress. However, new diseases were brought by European explorers in the 17th century, and the prehistoric population was almost completely eliminated.

Currently, six sites are listed on the National Register of Historic Places and 12 are potentially eligible for the National Register. Of the 395 archeological sites, 18 appear to be of national significance, 160 of state significance, 211 of local significance, and six of no significance. Very little work has been done to nominate or seek determinations of eligibility for the other sites, and a great deal of justification and review remains to be accomplished before these sites can be enrolled.

HISTORIC RESOURCES

No comprehensive survey for historic resources has been completed. However, the Monroe Station, at the intersection of US 41 and Collier County 94, is probably eligible for nomination to the National Register.

Indian Settlement

The following aboriginal groups occupied what is now Florida at the time of European contact, ca. 1513: Acuera, Ais, Apalachee, Calusa, Freshwater, Guacata, Jeaga, Mococo, Ocala, Ocale, Ocita, Onatheeaqua, Potano, Saturiwa, Surruque, Tacatacura, Tallahassee, Tequesta, Timucua, Tocobaga, Utima, Yui, and Yustega (National Geographic Society 1972; Milanich and Fairbanks 1978). The Calusa and Tequesta used the Big Cypress area during the period of Spanish exploration and before the arrival of the Miccosukees and Seminoles. All of the aboriginal groups inhabiting Florida at the time of European contact had become virtually extinct as peoples by the middle of the 18th century because of European diseases and the migrations of Indian groups like the Creeks from the north (Mahon 1967).

The Miccosukees are descendants of the Hitchiti-speaking Lower Creeks, and the Seminoles of the Muskogee-speaking Upper Creeks. These groups migrated to Florida in the 18th and 19th centuries from Georgia and Alabama (Covington 1968; Garbarino 1972; Hudson 1976). The Creeks living along the Coosa and Tallapoosa rivers were known as the Upper Creeks and those along the Chattahoochee, Flint, and Ocmulgee rivers as the Lower Creeks (Nunez 1958; Covington 1979). Then as now, the ethnic distinction between the Miccosukees and Seminoles stems from a difference in language; their cultures are essentially the same.

The movement of Creeks into Florida must be understood in terms of internal Creek affairs and diverse reactions to competing European powers. Migration occurred over many years, spurred by Queen Anne's War of 1701-1713, the Yamasee War of 1715-17, and the Creek War of 1813-14. A factor in the shifting loyalties of Indian groups to one another and to the Spanish or British was their growing dependence on European trade goods, which made them vulnerable to the frontier economics of manipulation, exploitation, and the cutoff of supplies (NPS, Paige and Van Horn 1982c). By the end of the Creek War of 1813-14, the migrant native American population of Florida had grown to about 5,000.

The Seminole Wars – a prolonged series of search-and-destroy missions grouped in three different war periods from 1817 to 1858 – gave rise to the U.S. government policy of Indian removal. In the First Seminole War, 1817-18, President James Monroe ordered General Andrew Jackson to pursue Indians in Florida, which was Spanish territory. As a consequence of that war, the United States acquired Florida from Spain in 1819. Beginning in 1822 and ending in 1858, the U.S. government made several efforts to remove Indians from Florida, some of which were successful. The Indian Removal Act of 1830 and the Second Seminole War, 1835-42, resulted in the removal and relocation of many Florida Indians to reservations west of the Mississippi River. After the Third Seminole War, 1855-58, Chief Billy Bowlegs agreed to removal terms, and he and about 150-200 others were relocated to the Oklahoma Indian Territory. Some Miccosukees and Seminoles were wary enough to refuse to move, and they retreated into the vast Everglades and Big Cypress swamps, as they had done after each of the Seminole wars (Gray 1900; Kersey 1975a and 1975b; NPS, Paige and Van Horn 1982c).

The remnant Miccosukees and Seminoles were not pursued further after 1858, and they lived essentially undisturbed until 1928. That year the Tamiami Trail (US 41) was opened, marking the beginning of significant alterations to the lifeways the Indians had adopted in the Everglades, which consisted of hunting, gathering, and fishing, with limited gardening. Of necessity, they began to change gradually from a subsistence economy to a cash economy (NPS, Paige and Van Horn 1982c).

Today, there are three groups of Miccosukees and Seminoles in Florida: The Seminole Tribe of Florida, organized in 1957; the Miccosukee Tribe of Indians of Florida, organized in 1961; and the Trail Miccosukees, who live in roadside villages along US 41, mostly within Big Cypress National Preserve. The first two groups are officially recognized entities, entitled to federal programs and services on federal and state reservations they occupy north and east of the national preserve. The Trail Miccosukees, who are sometimes called the Traditional Miccosukees (personal communication with J. Anthony Paredes, Department of Anthropology, Florida State University, 1989), remain by choice unaffiliated and unorganized (Hudson 1976).

European Settlement

From the 17th to late 19th centuries there was little to no occupation of the Big Cypress by Europeans, although pirates were active in the nearby seas during the late 18th and early 19th centuries. By the early 20th century, hundreds of sport and commercial hunters were exploiting the glades resources. The opening of US 41 ensured easy access for hunters and trappers. Permanent homes were rare, and the isolation and harsh environment compelled people to be self-reliant. Although soils in the area were fertile, it was the exploitation of fish resources, along with animals and birds for skin and feathers, that was most economically important. Lumbering and charcoal making were also attempted. The most spectacular commercial enterprise in the glades was the enormous land promotion that occurred in 1925. Lands were never surveyed; sales and development were merely on paper.

CURRENT STATUS

As of 1982 the majority of cultural resource sites (286 or 68 percent) within the preserve were considered to be in good condition, probably because of poor access, vegetation cover, and their dispersion. Adverse effects on archeological resources could result from vandalism, animal burrowings, exotic plants, use and development of inholdings, fire, erosion, and oil and gas exploration and development. Vandalism and animal burrowings appear to be the most severe resource threats, followed by exotic plants and construction associated with inholdings.

Vandalism has affected several sites and is an acknowledged management problem. Detailed information on the extent of vandalism is not available, and the data collected during previous archeological surveys needs to be updated. The most serious impacts are caused by amateur or professional treasure hunters. There is particular concern about vandalism at approximately 14 of the larger, more readily visible sites, where artifact concentrations are dense and metal detectors have been used. Likewise, native American sites have been vandalized. Enforcement of the Archeological Resources Protection Act and chapter 872, Florida Statutes 1987, is essential.

Armadillos are attracted to the organic soils present at archeological sites, and they cause extensive damage while burrowing for insects. Feral hogs also damage archeological sites as they root for food; and the disturbed soil opens the way for invasion by exotic plants.

The Brazilian pepper and Australian pine are damaging the nationally significant Turner River site (BICY-003) because the exotics have overgrown the site, and the site's stratigraphy is being disturbed by roots. No known cultural resource sites are currently threatened by melaleuca.

The National Park Service does not have accurate information on which archeological sites are being affected by hunting camps and other property inholdings. Cultural resources in these areas have probably been damaged because these same sites were historically used as habitation sites.

Fire has not significantly harmed cultural resources because sites are generally located on hammocks surrounded by wetlands. As fuel loads are reduced, so is the threat of significant damage. Of course, historic wooden structures are sensitive to fire, and prehistoric sites containing concentrations of organic matter could be damaged by very hot fires if humic soils were ignited. This could have a severe impact on a site's strata, causing compaction and loss or alteration of carbonized plant remains.

No oil and gas development has directly affected any known archeological sites. However, roads provide easier access to more remote areas, thereby increasing the potential for vandalism. Likewise, the Florida state historic preservation officer has advised that ATVs and other ORVs have contributed to archeological site damage through erosion along the trails and through vandalism as a result of easier access to otherwise remote sites.

SOCIOECONOMIC ENVIRONMENT AND LAND USE

Big Cypress National Preserve lies in three counties in south Florida – Collier, Dade, and Monroe. Most of the preserve is within Collier County, a thin strip on the eastern edge is in Dade County, and approximately the southern third is within Monroe County. The urban areas of Collier County are along the Gulf Coast. This area is a rapidly growing region that it is not yet as densely populated as Florida's Atlantic coast. Dade County includes Miami and a large portion of the greater Miami metropolitan area, and urban development pressures are now pushing westward toward Everglades National Park and Big Cypress. The populated areas of Monroe County are all located along the Florida Keys, south from Palo Alto Key to Key West.

POPULATION TRENDS

South Florida has experienced tremendous growth since the end of World War II, particularly during the late 1950s and into the 1960s. Collier County is the fastest growing of the three counties, and its population increased by 126 percent from 1970 to 1980 (see table 26). The population of Dade County increased by 78 percent during this same decade, and Monroe County by 20 percent. The population increases suggest a growing potential visitor base for Big Cypress, as well as other parks in the south Florida region.

Table 26: South Florida Population Statistics

	Dade County	Monroe County	Collier County
Total Population			
1970	1,267,792	52,586	38,040
1980	1,625,781	63,180	85,971
Percentage Change	+ 78	+ 20	+126
Total Minority Population			
1970	196,130	4,896	6,979
1980	363,506	5,254	11,310
Percentage Change	+ 85	+ 7	+ 62
Median Age			
1970	34.2	27.3	35.2
1980	34.8	35.5	38.2

Population growth is primarily due to the rapid in-migration of retirees and people from the Caribbean and Latin America, not a high birthrate. One effect of this in-migration has been a disproportionate number of senior citizens. The median ages in the three counties increased from 1970 to 1980: in Collier from 35.2 to 38.2, in Dade from 34.2 to 34.8, and in Monroe from 27.3 to 35.5. These patterns are indicative of age changes occurring all across the Sunbelt, and they may represent a need for more programs aimed at senior citizens.

Another effect of this in-migration is the high percentage of minorities, and particularly Spanish-speaking residents. Between 1970 and 1980 Dade County experienced an 85 percent increase in the number of minority residents, Collier County a 62 percent increase, and Monroe County a 7 percent increase. The growth in minority residents indicates a potential need for bilingual interpretive programs.

The median family income for Collier and Monroe counties for 1980 was slightly below the national average of $19,917, but higher than the state average of $17,280. The median family income in Collier County was $18,700 and in Monroe County $18,050. The Dade County median family income was $20,176, ahead of both the state and national averages.

LAND USE

Extensive public lands are adjacent to Big Cypress National Preserve. Everglades National Park to the south, Fakahatchee Strand State Preserve and Collier-Seminole State Park to the west, and state conservation area 3A to the east are all managed for varying degrees of resource conservation and recreation.

Land use in the rest of south Florida is characterized by increasing urban development and the agglomeration of family farmsteads into large agribusiness holdings. The extensiveness of these agricultural industries is having increasing effects on ecological systems. Growing demands for water and runoff of chemical insecticides and fertilizers are becoming concerns for conservationists in the region. Miles and miles of row crops and citrus orchards, with their associated irrigation systems, can seriously disrupt natural systems.

The weather patterns of the last five to 10 years seem to indicate a southward creep in the frostline, and citrus orchards are gradually being moved to the south. As a result, parks and natural preserves in south Florida are facing increasing ecological pressures around their boundaries.

Other regional industries and associated land use changes that could affect the preserve include forestry and fishing. The forestry industry in south Florida originally developed around the freshwater wetland cypress forests, but by 1950 most of the large cypresses in what is now the preserve had been cut.

In some areas land developers and the fishing industry are competing for the use of the same natural resources. The fishing industry is dependent on the productivity of the coastal waters. This natural productivity is sensitive to the numerous changes accompanying other types of economic development, particularly those involving the destruction of wetlands and estuarine areas that are essential to marine food chains.

VISITOR USE

A variety of visitor activities are offered throughout south Florida, but most of these focus on Everglades National Park and nearby state parks rather than Big Cypress National Preserve.

OVERVIEW

South Florida

Shark Valley and Ten Thousand Islands, two areas of Everglades National Park, are popular tourist attractions on US 41, just east and west of the preserve. Folders and general information about Big Cypress are available at these two areas. Another tourist attraction is the Cypress Bend boardwalk, within Fakahatchee Strand State Preserve, about 8 miles west of the preserve on US 41. The 2,000-foot boardwalk meanders through one of the few remaining virgin stands of cypress, which has been designated as a national natural landmark. This cypress stand provides a marked contrast to the second-growth cypress stands within the preserve. Collier Seminole State Park (approximately 15 miles east of preserve headquarters on US 41) and Corkscrew Swamp Sanctuary (approximately 30 miles northwest of the Bear Island unit) also attract significant numbers of campers and sightseers.

Big Cypress National Preserve

The primary visitors to Big Cypress are hunters, ORV users, and owners of exempt inholdings rather than the general public. Only a minimal effort has been made to inform the general public about the preserve. General visitor activities are limited to what can be seen and accessed from Florida 84 and US 41, the major highways. Entrance signs on both roads are posted at the boundaries. Visitor information is provided at the Oasis ranger station on US 41 in the middle of the preserve. This is the only signed NPS facility within the preserve, and visitors can stop to use the restrooms or get preserve folders, regional brochures, and various permits. Other than a film, no interpretive activities or tours are offered.

Picnic tables are provided at two small roadside parks west of Oasis on US 41 – Kirby Storter and H. P. Williams. Both parks are managed by the Florida Department of Transportation. Kirby Storter has a short boardwalk through a small cypress strand (no interpretation is provided). At H. P. Williams the picnic tables overlook the Turner River canal.

Borrow canals along the two major highways and three secondary roads within the preserve are popular for fishing and wildlife viewing. These canals provide the public with probably the best opportunities to see alligators and a variety of wildlife. Guardrails block views of canals from the road, so visitors must park and get out of their cars for clear views.

Visitors are not encouraged to drive on the Loop Road because of the extremely poor road conditions. Collier County gravel roads (837, 839, and 841) provide access to improved properties within the preserve, but tourists generally do not use them because no interpretive activities are provided.

The Loop Road interpretive center in Pinecrest is operated by Everglades National Park. The center provides scheduled nature activities and tent camping opportunities for school groups in the south Florida area. The center does not provide orientation or interpretive programs or activities for the general public.

Four commercial use permits have been issued in the preserve, but only one holder offers short, scheduled tours for visitors to limited portions of the preserve, either by airboat or swamp buggy. The remaining three do not provide scheduled tours and may take as few as one or two airboat or swamp buggy tours per year.

HUNTING

General Regulations

Big Cypress National Preserve has been designated by Florida as a wildlife management area, and the National Park Service permits hunting and fishing by the public in accordance with state laws and regulations.

The responsibilities of both the National Park Service and the Florida Game and Fresh Water Fish Commission with respect to hunting and fishing activities are defined in a memorandum of understanding between the two agencies. Both agencies have concurrent jurisdiction for enforcing game and fish laws within the preserve. The commission consults with the Park Service before issuing regulations that affect hunting and fishing within Big Cypress. Likewise, the Park Service consults with the commission before establishing any temporary or permanent closures or public use limits.

Deer, wild hogs, turkeys, gray squirrels, quail, rabbits, raccoons, opossums, armadillos, beavers, coyotes, skunks, nutria, and designated migratory game birds are all legal take within the preserve, subject to regulation. Bag and possession limits are as follows:

> Deer, wild hogs, and bearded turkeys – daily limit one, seasonal limit two for each game species (all hunts combined)
>
> Gray squirrels, quail, or rabbits – daily limit 12, possession limit 24 for each game species
>
> Raccoons, opossums, armadillos, beavers, coyotes, skunks, and nutria – no bag limit

The following typical hunting seasons were permitted within the preserve during 1986 and 1987.

> bow hunting – September 6 through 28
>
> muzzle-loaded guns – October 4 through 19

general gun – November 8 through January 4

small game – January 5 through March 1

spring turkey – March 14 through April 19

raccoon (night) – July 1 through November 7, January 5 through March 1

Hunters are required to purchase Florida state hunting licenses and wildlife management area stamps when hunting in the preserve. Anyone wishing to hunt in the preserve during the first nine days of the general gun or muzzle-loaded gun season (if hunting in the Bear Island unit) must also apply for a quota permit, which is transferable. The number of these transferable permits varies for each of the five designated hunting areas. Only hunters with quota permits can hunt in the preserve during the first nine days of the general gun season.

Dogs are prohibited in the Loop unit, and dogs used for deer and hog hunting (other than bird dogs and waterfowl retrievers) are prohibited in the Bear Island unit and in the Monument, Deep Lake, and Stairsteps units except during the first nine days of the general gun season.

Approximately 85 percent of the ORV use within the preserve is associated with hunting. ORVs used for hunting have to meet certain design standards (see "ORV Use" section), and drivers must have special permits from the National Park Service. Hunters in the Bear Island unit who use ORVs can enter and exit only through the designated entry point at the north end of Turner River Road. No vehicles are allowed in the Loop unit.

The use of lightweight, all-terrain vehicles (ATVs) for hunting was prohibited by the Florida Game and Fresh Water Fish Commission in 1985. This regulation was adopted following a dramatic increase in the use of three- and four-wheeled ATVs within the preserve during the previous three years. From 1981 to 1984 over 50 percent of the NPS special off-road vehicle registrations were issued for ATVs (FGFWFC 1986). Because ATVs were being used more and more for hunting, often in conjunction with buggies and off-road trucks, the commission concluded that ATVs have contributed more to the accelerating intensity of recreational hunting pressure in the preserve than any other vehicle type (FGFWFC 1985c).

Deer and Hog Hunting

Hunting regulations for white-tailed deer and hogs have been implemented to help protect the endangered Florida panther. The quota system was started in 1980 to limit the number of hunters within the different units of the preserve during the first nine days of the general gun season. While the available quota permits were reduced from 15,250 in 1980-81 to 3,250 in 1984-85, the reduction had no real effect on the number of quota permits actually filled nor did it apparently cause any actual reduction in the number of hunters in the preserve over this time (see table 27). No hunters were denied permits during the first nine days of the season between 1980 and 1985. Also, the number of quota permits actually filled between the 1980-81 and the 1984-85 hunting seasons has remained fairly constant for all units (see table 27). Because of concerns about the potential effects of hunting on the Florida panther, approximately 700 fewer permits were issued during the 1985-86 hunting season.

Table 27: Quota Permits Available and Filled, 1980-1985

	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
Bear Island						
Permits available	250	250	250	250	250	250
Permits filled	250	250	250	250	250	250
Monument/Deep Lake						
Permits available	10,000	5,000	5,000	1,500	1,500	1,000
Permits filled	1,389	1,652	1,839	1,424	1,500	1,000
Stairsteps/Loop						
Permits available	5,000	3,000	3,000	2,440	1,500	1,250
Permits filled	904	1,175	1,479	1,403	1,464	1,250
Totals						
Permits available	15,250	8,250	8,250	4,190	3,250	2,500
Permits filled	2,543	3,077	3,568	3,077	3,214	2,500

Hunting pressure (measured in terms of person-days) increased substantially between the 1982-83 and 1984-85 hunting season (see table 28). This occurred at a time when the number of quota permits filled declined by approximately 350 (see table 27). The increase in hunting pressure could have occurred because people with permits hunted more frequently or the permits were more often transferred, allowing more people to hunt during the first nine days. Also more people may have hunted more frequently after the first nine days. The higher figures for the 1984-85 hunting season may also be due to increased staffing and improved checking and surveying methods.

Several variables may have contributed to the 29 percent reduction in hunting pressure that occurred from 1984-85 to 1985-86 (table 28). Hunters could no longer use ATVs, and dogs were only allowed during the first nine days of the general gun season. (Previously dogs could be used for the entire 60-day general gun season.) These restrictions may have discouraged some hunters. Also, because fewer quota permits were available, hunters were denied permits during the 1985-86 hunting season for the first time. However, since the permits are transferable, it is difficult to determine if issuing fewer permits really reduced the number of hunters in the preserve.

Table 28: Hunting Pressure and the Hunter Success Rate, Deer and Hog Season

	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
Hunter-days	14,250	16,539	18,625	23,015	24,360	17,195
Hunter success rate	1.3%	0.9%	1.5%	1.5%	1.6%	1.6%

Source: Checked harvest data, Florida Game and Fresh Water Fish Commission 1986.

Another important factor is that budget restrictions severely reduced the number of staff assigned to survey and collect hunting data during the 1985-86 hunting season. The lower hunting pressure figures could be attributed to the fact that fewer hunters were observed, surveyed, or contacted because of the limited number of survey staff in the field during the 1985-86 hunting season.

The total numbers of deer and hogs legally harvested in the preserve from 1980-81 through 1985-86 are shown in table 29. Deer and hog harvest figures in various units are compared for three seasons in table 30. The deer harvest figures somewhat parallel the hunting pressure statistics in that both are at their highest during the 1984-85 hunting season, which also coincides with increased staffing and improved survey methods used during this one season. The number of deer harvested (combined seasons) in the Monument unit increased by approximately 400 percent from the 1983-84 season to the 1984-85 season, an increase that was attributed to improved survey and checking operations (FGFWFC 1985a).

The deer harvest decreased by 25 percent between the 1984-85 and 1985-86 hunting seasons. Even though the additional hunting restrictions may have contributed to this decline, reduced staff levels for field checking and surveying may also have resulted in lower harvest figures.

Table 29: Deer and Hogs Harvested in Big Cypress National Preserve

	Deer	Hogs
1980-81	103	81
1981-82	104	44
1982-83	145	141
1983-84	140	201
1984-85	207	195
1985-86	156	111
Average annual harvest	142	128

Source: Checked harvest data, Florida Game and Fresh Water Fish Commission.

Table 30: Comparisons of Annual Deer and Hog Harvests, by Unit

	Deer			Hogs		
	1983-84	1984-85	1985-86	1983-84	1984-85	1985-86
Bow						
Bear Island	4	2	2	9	6	1
Deep Lake	0	0	0	0	0	0
Monument	0	1	1	0	0	2
Stairsteps	1	0	1	1	2	0
Loop	2	0	2	0	1	1
Subtotal	7	3	6	10	9	4
Muzzle-loading Gun						
Bear Island	9	7	15	39	21	5
Deep Lake	0	0	0	0	0	0
Monument	0	2	3	0	2	13
Stairsteps	3	4	3	7	7	1
Loop	3	3	2	5	4	3
Subtotal	15	16	23	51	34	22
General Gun						
Bear Island	16	19	30	42	33	20
Deep Lake	0	0	1	1	0	2
Monument	18	75*	30	16	37	6
Stairsteps	76	76	51	64	68	41
Loop	8	18*	15	17	14	16
Subtotal	118	188	120	140	152	85
Combined Seasons						
Bear Island	29	28	47	90	60	26
Deep Lake	0	0	1	1	0	2
Monument	18	78*	34	16	39	21
Stairsteps	80	80	55	72	77	42
Loop	13	21*	19	22	19	20
Total	140	207	156	201	195	111

Source: Florida Game and Fresh Water Fish Commission 1986.

*The increase in the number of deer harvested is a result of improved checking operations in the Monument and Loop units.

Raccoon Hunting

Raccoons may be hunted at night (except in the Bear Island and Loop units) using a light and dogs. Night hunting has caused management concerns about controlling illegal poaching of deer within the preserve and possible disturbance to Florida panthers.

Frogging

The taking of amphibians within the preserve is currently illegal under NPS regulations. However, frogging is legal under Florida regulations. Recreational frogging does occur within the preserve and is enforced as a legal activity by both the state and the National Park Service. No daily or possession limits have been established for frogs. Commercial frogging is illegal within the preserve.

ORV USE

Use of ORVs in Big Cypress has been growing since the late 1930s, when the first swamp buggy was built (Stone 1979). ORVs have long been recognized as a practical means of transportation in the south Florida wetlands, and their use was cited in the congressional report and establishing legislation for the preserve as an appropriate activity that should be properly regulated. Five types of recreational ORVs are now used in the preserve: street-legal four-wheel-drive (4 x 4) offroad vehicles and trucks, wheeled swamp buggies, tracked vehicles (both full track and half track), airboats, and small three- or four-wheeled cycles commonly called all-terrain vehicles (ATVs). Street-legal vehicles and ATVs are commercially manufactured and sold. But swamp buggies, tracked vehicles, and airboats are custom-built, usually designed and constructed by the owner at considerable time (often requiring a year or more of after-hours work) and expense (some newer vehicles with a trailer and spare parts may exceed $10,000).

Recreationists use ORVs in the preserve for access to backcountry camps; for hunting, fishing, and frogging access; and for recreational riding to explore the Big Cypress and to view wildlife and other natural features. For many ORV users an important part of the experience is the challenge of building, operating, or maintaining a machine that can handle the physical demands of the landscape.

In addition to recreational ORVs, oil and gas exploration companies previously operated in the preserve using large, specially designed ORVs. These exploration vehicles were constructed to overcome almost any natural obstruction in order to run straight-line transects for seismic testing. However, cutting swaths through the vegetation for transects has been curtailed by the National Park Service, and oil company vehicles are now required to use existing trails.

All recreational ORVs operated in the preserve must display an NPS permit. Since 1986 permits have been issued for $25 annually; to get a permit, a vehicle must have a spark arrestor, proper lighting, and safety flags for airboats and amphibious vehicles (primarily tracked vehicles). Prior to 1986 permits were free and issued only once. Between October 1980, when free permit system was begun, and December 31, 1985, the National Park Service issued over 9,000 permits. Permit classifications by vehicle type are shown in table 31. During the 1986-87 hunting season the National Park Service issued 1,627 annual ORV permits.

Table 31: ORV Permit Classifications

Vehicle Type	Number of Permits Issued	Percentage of Total
ATV	4,832	52
Street-legal ORV (4 x 4)	2,146	23
Four-wheeled swamp buggy	1,326	14
Airboat	823	9
Full-tracked vehicle	64	0.7
Half-tracked vehicle	50	0.5
Six-wheeled swamp buggy	16	0.02
Total	9,257	

In addition to the NPS permit, owners of street-legal ORVs must have standard Florida vehicle registrations; owners of ORVs that are not street-legal (except ATVs) must pay $10 annually for an ORV permit from the state. Permits require the vehicle to have four rubber tires at least 9 inches wide and a 60-inch minimum wheelbase; tracked vehicles must have no more than 9 linear feet of track touching the ground. There are no state restrictions on airboats, and ATVs do not have to be registered with the state. Since the 1985-86 hunting season, ATVs have been banned from hunting use.

Currently all recreational ORVs are prohibited within the Loop unit, on the Eleven Mile Road (except at designated crossings), on the Florida National Scenic Trail (except to cross the trail); in the Bear Island unit ORVs must enter and exit only at Turner River Road. Preserve regulations prohibit operating an ORV in a manner that could significantly damage natural or cultural resources. Also cutting, grading, filling, or ditching to build new trails or to improve old ones is prohibited without authorization from the superintendent. In addition, the superintendent has the authority under Executive Orders 11644 and 11989, as well as the preserve's enabling legislation, to close areas or trails to ORV use if continued use could cause unacceptable resource damage (see 36 CFR 1.5(c)).

The terrain in the preserve generally determines ORV use patterns. For instance, airboats and tracked vehicles are used primarily in the marshes and open wet prairies south of US 41 and Loop Road. Airboats have the least impacts on soils and vegetation of any ORV type. Tracked vehicles, in comparison, have been found to have the most detrimental effects because tracks in marshes and other vegetation types are long lasting (see Duever et al. 1981; Duever et al. 1986b). Except under drought conditions, wheeled vehicles are precluded from much of the airboat country by deep marl soils, which when saturated provide little traction. However, wheeled vehicles are almost exclusively used in shallow marl soils, sandy soils, and drier, forested upland areas – conditions that are more common north of US 41.

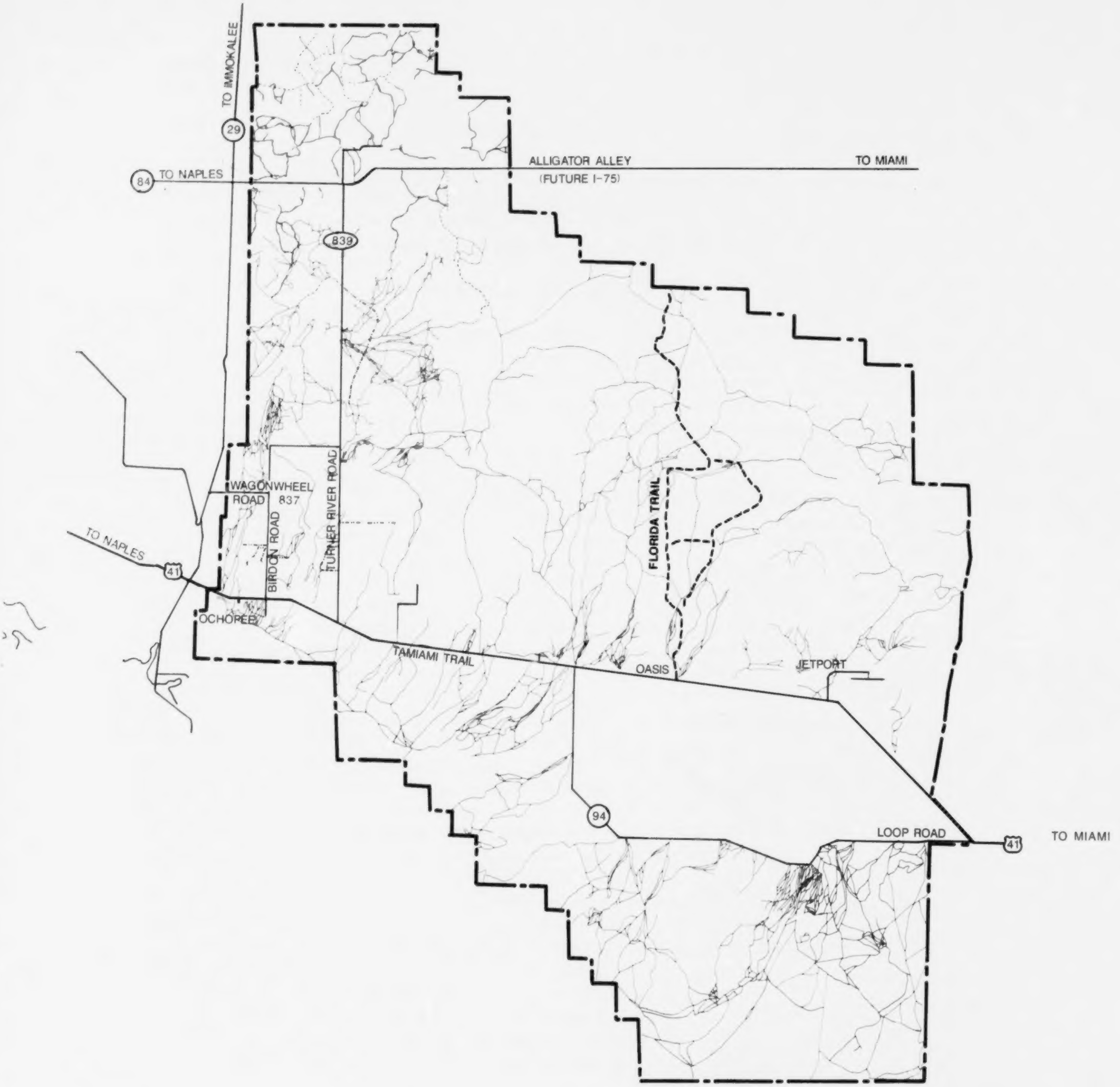
In forested areas swamp buggies tend to be limited to established trails that accommodate their large tires and overall width, but buggies are less constricted in prairies and savannahs. Swamp buggies have basically two tire types – balloon tires and tractor tires. Balloon tires are designed to maximize surface area, minimize surface pressure, and essentially float over the ground surface. Tractor tires are thinner and have deep treads to dig through soft surface soils to gain traction on deeper, more consolidated material. Because of their digging action, tractor tires cause more soil disruption than balloon tires and tend to have longer lasting effects.

ATVs, with their light weight and short axle length, are less confined to trails than swamp buggies and can cover ground more quickly. Research has shown that ATVs have the least impact on soils and vegetation of any wheeled ORV type in Big Cypress (Duever et al. 1981; Duever et al. 1986b). However, the proliferation of ATVs over the last few years has led to concern about their overall impact, particularly regarding disturbance to wildlife.

According to the Specialty Vehicle Institute of America, wholesale sales of ATVs in Florida more than quadrupled between 1980 and 1985. Although there are no specific use figures, it is probable that a similar increase in ATV use occurred in the preserve. During the 1984-85 hunting season the state game commission issued 2,484 permits for ATVs in Big Cypress, constituting 52 percent of all ORV permits issued that season. The dramatic increase in ATVs led the commission to ban ATV use for hunting in 1985. The commission cited the cycles as being primarily responsible for accelerating hunting pressure in the preserve. By their sheer numbers, ATVs greatly increased human activity in the Big Cypress backcountry.

Street-legal four-wheel-drive vehicles (4 x 4s) are the most limited ORV types in use in the preserve. They require the driest driving conditions and rarely penetrate very far into the Big Cypress backcountry. Accordingly, the effects on preserve resources are not great, even though a high number of permits has been issued.

The network of ORV trails in the preserve has developed haphazardly over the years. Numerous trails follow active and abandoned mineral access roads, former logging trams, and major prairies and marshes. Identifying ORV trails is difficult because a "trail" may range in size and permanence from a graded roadbed to a single set of tracks across an open prairie. To roughly estimate the current extent of ORV impacts, trails were mapped from 1:63,000 color-infrared aerial photographs taken in March 1984 by the U.S. Geological Survey. Initially, only trails clearly visible in the aerial photographs were mapped; consequently, trails through wooded areas were underrepresented because they were less evident in the photos. Major trails through such areas were added by the preserve staff, partially off-setting the deficiency. Based on this method, the total mileage for ORV trails in Big Cypress is conservatively estimated at 1,240 miles (see Existing ORV Trails map).


TO IMMOKALEE
29
84
TO NAPLES
ALLIGATOR ALLEY
(FUTURE I-75)
TO MIAMI
839
WAGONWHEEL
ROAD 837
BIRDON ROAD
TURNER RIVER ROAD
FLORIDA TRAIL
TO NAPLES
41
OCHOPEE
TAMIAMI TRAIL
OASIS
JETPORT
94
LOOP ROAD
41
TO MIAMI

OFF-ROAD VEHICLE ROUTES

——— ORV Trails Note: Based on trails visible in USGS high-altitude program imagery (March 1985) and on consultation with preserve staff

-··-—·· Abandoned, filled roads used by ORVs

– – – – – Active or former oil roads used by ORVs

EXISTING ORV TRAILS

BIG CYPRESS NATIONAL PRESERVE
United States Department of the Interior
National Park Service

DSC/MARCH 1989/176 – 20,046 -A

OTHER VISITOR ACTIVITIES

Camping

The only developed, full-service campground within the preserve is a commercially operated facility just east of Ochopee on US 41. Four undeveloped NPS camping areas along US 41 and adjacent to borrow ponds are also used. No water, electricity, toilets, ORV trails, or garbage services are provided at these four areas. Only two of the four campgrounds – Monument and Midway – have designated (numbered) campsites, and these are used primarily by hunters and people traveling during the winter. Hunting and fishing are major activities pursued by people who stay at these four camping areas. Hunters also use another undeveloped camping area in the Bear Island unit (no water, electricity, or garbage services are provided; portable toilets are installed during the fall hunting season).

Hiking

More than 500 miles (20 segments) of the Florida National Scenic Trail have been designated, extending from Backwater River State Park near Pensacola to Big Cypress National Preserve. There is a 42-mile segment between Florida 84 and US 41, and a shorter trail segment between the Oasis ranger station and the Loop Road. The shorter segment passes through one of the preserve's major cypress strands.

PROJECTED RECREATIONAL DEMAND

No official visitor use figures (either current or projected future use) exist for Big Cypress, but it is possible to combine a number of sources of data to arrive at useful projections. First, primary, secondary, and tertiary (or tourist) markets were defined. For Big Cypress the primary market includes people living within 200 miles of the preserve. (This range is generally considered the maximum distance for single-day visits.) The secondary market includes all persons living between 200 and 500 miles of Big Cypress, and the tertiary or tourist market includes national visitors who live farther than 500 miles from the preserve. The tourist market is not considered to be important to Big Cypress because relatively few people would travel to Florida solely to visit the preserve. For Big Cypress the primary market includes the large, urban areas of Tampa / St. Petersburg, Fort Lauderdale, Orlando, and Miami. The secondary market includes the large, urban areas of Jacksonville, Tallahassee, Gainesville, and Pensacola, plus Augusta and Savannah, Georgia. Table 32 shows the population Of the primary and secondary markets for Big Cypress.

Market penetration for any active-recreation attraction is commonly considered to be between 10 to 20 percent of the primary market, 5 to 15 percent of the secondary market, and 1 to 5 percent of the tertiary market. However, more realistic market penetration figures for Big Cypress are 5 to 7 percent of the primary market, 2 to 5 percent of the secondary market, and less than 1 percent of the tourist market. Therefore, the number of potential visitors to Big Cypress ranges from 520,000 to 743,000 of the primary market and 145,000 to 240,000 of the secondary market.

Table 32: Population within 500 Miles of Big Cypress National Preserve

Miles from Preserve	Population	Cumulative Population
0 to 49	349,858	349,858
50 to 99	2,069,196	2,419,054
100 to 149	2,340,289	4,759,343
150 to 199	2,668,894	7,428,237
200 to 249	1,454,332	8,882,569
250 to 299	254,765	9,137,334
300 to 349	352,140	9,489,474
350 to 399	398,140	9,887,614
400 to 449	1,383,601	11,271,215
450 to 499	970,965	12,242,180

Perhaps a more precise method of estimating the potential number of visitors is by combining certain data from regional projections of the Federal Bureau of Economic Analysis and the NPS nationwide recreation survey.

First the present and projected populations for the entire state of Florida were determined, and then the present and projected populations for areas within 100 to 125 miles of Big Cypress (defined by the Bureau of Economic Analysis as economic areas 43 and 44) were determined. These population projections were next broken down into the four age groups used in the nationwide recreation survey (see table 33).

Table 33: Population Projections for South Florida (Economic Areas 43 and 44), by Age Group

Age	Projected Population			
	1985	1990	2000	2030
12-24	1,167,583	1,145,379	1,348,855	1,528,594
25-39	1,478,356	1,631,176	1,596,892	1,683,275
40-59	1,230,686	1,388,831	1,930,339	2,203,218
60+	1,621,077	1,847,213	2,136,875	4,545,676

Based on this information, the various types of recreational demands in this population were determined. The nationwide recreation survey was then used to determine how demand would probably change over the next 40 years (see table 34).

Table 34: Demand Changes in Recreational Interests (Economic Regions 43 and 44)

	Percentage Change			
	1985*	1990	2000	2030
ORV use	+59.2	+5.6	+14.2	+18.2
Backpacking	+57.9	+4.7	+12.9	+10.8
Camping in primitive campground	+61.1	+5.8	+14.0	+18.6
Bird-watching and other nature study activities	+70.7	+9.9	+16.6	+44.8
Picnicking	+67.8	+8.6	+15.3	+30.7
Driving for pleasure	+69.4	+9.0	+15.3	+34.3
Sightseeing	+67.8	+8.9	+15.9	+32.9

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*Percentage change since 1970.

These figures are an attempt to project future demand for certain recreational activities in south Florida. The absolute numbers that were needed to derive the demand are not as important as are the percentages of demand change that might be expected. The recreation types studied (ORV use, backpacking, camping, birdwatching, picnicking, sightseeing, and driving for pleasure) are all expected to have an increase of demand of around 15 percent by the year 2000. In addition, by that year hunting is expected to increase by 16.9 percent and fishing by 29.1 percent. Perhaps the most surprising of these statistics is the growth in fishing demand and the relatively low growth in demand for ORV use, which would have corresponding effects on recreation demand in Big Cypress National Preserve.

ENVIRONMENTAL CONSEQUENCES

DERIVATION OF IMPACT TOPICS

SIGNIFICANT IMPACT TOPICS

To focus the discussion of the potential consequences of the proposed action and alternatives, specific impact topics were selected. Selections were based on concerns expressed by the public and other agencies during scoping (see "Consultation and Coordination"), legislative requirements, and resource studies in the preserve. The rationale for selecting major impact categories is discussed below. Environmental consequences are described by alternative in the following sections.

Water Resources

Water was named in the establishing legislation as a prime resource. Two impact topics are considered: surface water flows and water quality.

Surface water flows – The pattern and timing of the flow of water across Big Cypress is the primary determinant of the distribution, composition, and structure of ecological communities. Development can alter, and has altered in the past, natural surface flows, with subsequent effects on the natural environment.

Water quality – Surface and subsurface water quality was selected as an impact topic because it directly affects the health and condition of natural communities, as well as the human environment. Several aspects of the proposed action and alternatives, such as continued oil and gas operations, the application of herbicides for exotic plant control, and the provision of visitor use facilities, involve potential contaminants.

Biological Resources

The following biological resources were selected as impact topics because they were identified as important resources during planning: cypress strands/mixed-hardwood swamps/sloughs and cypress domes, marshes, mangroves, old-growth pinelands, hardwood hammocks, the Florida panther, the Cape Sable seaside sparrow, the red-cockaded woodpecker, and the bald eagle. Each of these resources is discussed in the "Planning Perspective" section. Two additional biological resources not cited as important resources are included as impact topics: *Liguus* tree snails, and white-tailed deer and feral hogs.

***Liguus* tree snails** – Liguus tree snails are endemic to hardwood hammocks of south Florida and are protected by the state as a "species of special concern." They are included as an impact topic because of their legal status and the vulnerability of their habitat to visitor use, development, and management actions.

White-tailed deer and feral hogs – White-tailed deer and feral hogs are common in the region. They are included as an impact topic because of their importance as prey for the endangered Florida panther and as the principal big game animals for hunting in the preserve.

Air Quality

Air quality is included as an impact topic because it is a general issue of regional and national concern and is an indication of human influence on the natural environment.

Cultural Resources

Cultural resources are included as an impact topic because archeological, historical, and native American religious sites were identified as important resources in the development of the plan (see "Planning Perspective" section). Their protection is mandated by federal law.

Use and User Groups

Use and user groups are included as part of the human environment subject to impacts from the proposed action and alternatives. Topics are hunting and hunters, off-road vehicle users, other visitors, private property owners, and mineral interests.

> **Hunters and hunting** – Hunting is the most popular recreational activity in the preserve.
>
> **Off-road vehicle users** – ORVs are used in conjunction with hunting, and ORV use in its own right constitutes the second most popular recreational activity in Big Cypress.
>
> **Other visitors** – This topic includes anglers, hikers, natural history observers, and regional and national tourists.
>
> **Nonfederal property owners** – Owners of exempt inholdings who have residences or commercial properties in Big Cypress.
>
> **Mineral Interests** – Mineral owners and operators could be financially affected by actions stemming from the general management plan.

IMPACT TOPICS NOT INCLUDED

Other Protected Species

Five protected species (the Florida panther, Cape Sable seaside sparrow, red-cockaded woodpecker, bald eagle, and *Liguus* tree snail) are included as impact topics because they are in need of specific management actions and subject to the effects of management, visitor use, or development. Other species listed by the federal and state governments are not in need of specific management, other than general protection afforded by the national preserve, and they will not be affected by the proposed or alternative actions.

Other Vegetation Types

Prairie, cypress prairie, second-growth pinelands, and disturbed areas are not included as impact topics because they are widely distributed in the preserve, do not provide limited or exceptional habitat, and are not major contributors to the hydrology. This is not to say that these vegetation types are not significant to the overall health of the Big Cypress swamp, but they have a somewhat lesser role than the types listed as important resources. The scale of direct occupancy of these types is indicated in the development scenario tables for the proposed action and each alternative.

Native Americans

If proposed concession services are found to be viable and Miccosukee or Seminole groups elect to operate concessions, they may economically benefit from this opportunity. Except for the future development of use and occupancy regulations, none of the other actions described under the proposed action or the alternatives are expected to significantly affect Miccosukee or Seminole Indians within Big Cypress National Preserve. Once specific use and occupancy regulations have been developed, their impacts on the Miccosukee and Seminole groups, as well as on natural and archeological resources in the preserve, will be assessed and documented, in compliance with the National Environmental Policy Act.

Trespass Camps Users

Trespass camps do not meet the definition of "improved properties" in the establishing legislation, and the National Park Service is under obligation to remove them. This will be an ongoing activity independent of the proposed action or alternatives; therefore, impacts on trespass camp users are not associated with the general management plan and are not included as a topic.

IMPACTS ON SURFACE WATER FLOWS

Analysis. Impacts of the proposed action on surface water flows would be primarily beneficial. The major effect would result from the restoration of more natural sheet flows and hydroperiods to as much as 38,000 acres as a result of the Turner River/Deep Lake Strand, Loop Road/Paces Dike, and possibly the Bear Island Road restoration projects. As part of the Turner River project, the proposed system of plugs and culverts in the Turner River and Birdon Road canals are expected to alleviate the drainage effect of the canals and to restore more natural flows to at least 3,000 acres of adjacent land where hydroperiods are currently reduced 65 percent of the time. The proposed rehabilitation would also increase flows in the natural course of the Turner River and would divert flows from the Turner River canal. At bridge 83, the US 41 bridge over the Turner River, the river is now mostly stagnant, with flows occurring only 38 percent of the time; with rehabilitation, flow frequency would increase to an estimated 88 percent. Currently, maximum flows occurring 10 percent of the time at bridge 83 reach only 45 cubic feet per second (cfs); after the rehabilitation maximum flows 10 percent of the time would equal or exceed 340 cfs (NPS, Rosendahl and Sikkema 1981d).

As yet the impoundment effect of the Loop Road on surface flows in the southern portion of the preserve have not been studied, but hydrologists have observed water level differences of more than half a foot between the northern (upstream) and southern (downstream) sides of the road (Schneider and Flora 1986). It has been estimated that surface flows could be significantly affected as much as 2 miles on either side of the road, an area of about 28,000 acres, including 1,340 acres contained by Paces Dike (Sikkema, personal communication 1987). The road may be influencing water levels in the area between Gator Hook Swamp and East Slough southward to the mangrove estuary in Everglades National Park. Therefore, correcting drainage problems under the Loop Road and breaching Paces Dike would be expected to restore natural drainage patterns to 28,000 acres, approximately 5 percent of the preserve.

There have been no quantitative studies of surface flows under Bear Island Road between Okaloacoochee Slough and East Hinson Marsh. The Bear Island Road follows a slight divide between the slough and the marsh, and water exchange appears to only occur between the two drainages during high water periods. If, based on water quality studies, the decision is made to improve the culverting beneath Bear Island Road, then about 7,000 acres of East Hinson Marsh could be affected by slightly longer hydroperiods. The effect of the improved drainage into the marsh would probably not be great because increased flows would occur during the wet season when the marsh is already saturated. Conversely, if a decision based on water quality concerns is made not to improve culverting under Bear Island Road, hydroperiods in East Hinson Marsh would continue to be slightly shorter than under more natural flow conditions.

Other beneficial effects of the proposed action would stem from actions to remove or breach filled sites in the backcountry of the preserve. About 30 miles of abandoned roads and several former developed sites would be treated. Filled roadways cause the most restriction of surface flow, and the proposed action would restore more natural flows to perhaps 100 acres of wetlands.

No significant effect on surface water flows is expected from proposed changes in ORV management. A study of water flows in ORV trails (Duever et al. 1981) found that flows increase in trails particularly during low water periods; but because trails are widely scattered and tend to follow high ground, the increases in surface flows are highly localized. The study concluded that ORV trails have a negligible influence on regional water resources.

Adverse impacts on surface flows from the proposed action would be much less extensive than the beneficial effects. Proposed NPS developments would occupy about 10 acres of existing wetlands, and about 3 acres of existing fill would be removed and surface flows restored, for a total of about 7 acres of surface flow displaced. Proposed NPS development sites could cause some minor alteration of flows around the fill pads, but the sites are on small (half acre or less), discrete pads rather than linear fills such as required by road construction. The pads are not expected to impound or divert surface flows.

To date geophysical activity (the placement of seismic lines) has affected an estimated 474 miles (862 acres) in the preserve (see Existing Oil and Gas Development Areas of Influence map). Aerial photographs taken in 1984 showed the extent of these lines. Anticipated future geophysical activities, which could be proposed anywhere in the preserve, would affect an estimated additional 433 miles (524 acres), some of which could be in wetlands subject to periodic surface flow; however, stipulations identified in the minerals management plan would mitigate or prevent most impacts (see appendix C). Any sediment mounds created during shot-hole drilling activities could alter water flows, but measures would be required to mitigate any adverse effects. Limestone caprock could collapse around some drill holes, resulting in sinkhole formation, ponding, and vegetation changes (for example, the invasion of cattails). These impacts would probably not be easily mitigated.

Past and present drilling and production activities have displaced 259 acres, and potential future development could displace an estimated 203 additional acres, including the development of 40 miles of access roads and pipelines. No new displacement of surface water flow would be allowed in the Bear Island unit. If oil and gas development occurred south of US 41, surface water flows could be disrupted and could cause adverse effects on the Ten Thousand Islands estuary in Everglades National Park. Hydrologic relationships in the Stairsteps and Loop units and the adjoining area of Everglades are highly sensitive, and the extent of impacts would depend on the location and scale of the potential petroleum development. Adverse hydrological effects, such as ponding, alteration of flow velocity and patterns, and water temperature changes, could occur in an area 500 feet on either side of these developments (see appendix B).

Conclusion. The proposed action would result in a net increase of an estimated 38,000 acres of area restored to more natural surface flows. About 7 acres of surface flow would be displaced for proposed NPS development, and up to 203 acres could be displaced by future oil and gas development. Overall oil and gas impacts are expected to be less under this proposal than under the status quo alternative because effects would be allowed on no more than 10 percent of the preserve at any one time, because no further displacement would be allowed in the Bear Island unit or in important resource areas, and because operational stipulations in the minerals management plan would be enforced. If oil and gas development occurred south of US 41, surface water flows could be altered in Big Cypress and Everglades.

Cumulative Impacts on Surface Water Flows. The most important effect of the proposed action in relation to the surrounding region would be to enhance the intangible value of the Big Cypress watershed as an example of the role of natural surface flows in south Florida ecosystems. Big Cypress National Preserve contains the largest relatively undeveloped watershed remaining in south Florida. As a publicly accessible natural area, it is unique in the region because the headwaters for surface flows are almost entirely within the preserve boundaries and are little influenced by external developments. In contrast, surface water flows in almost all other watersheds in south Florida have been greatly altered by urbanization, agriculture, and water control projects. The value of retaining natural watercourses and wetlands has only recently been recognized, and the state has enacted legislation and regulations to control further modifications to surface flows. However, given the expected continuation of urban and agricultural growth in the region, it is likely that surface flow alterations outside the preserve would continue over the next decade. The restoration of surface flows within the preserve and the continued manipulation of surface water in the surrounding region would increase the relative aesthetic, educational, and scientific values of Big Cypress.

Restoring more natural surface flows within the preserve would also restore a more natural distribution of surface water to the northwest portion of Everglades National Park. A study conducted in 1978 found that Big Cypress National Preserve accounted for 36 percent (340,700 acre-feet in 1978) of the surface water entering Everglades National Park annually. The annual volume of the discharge is unlikely to significantly change as a result of the proposed action. However, because of the proposed Turner River restoration project, annual discharge would be more evenly distributed through the mangrove area between the Turner River and Halfway Creek in Everglades National Park (about 700 acres). The rate of discharge in that same area would probably be slowed to a more natural frequency. With the channelizing effect of the canals removed, surface waters would be held longer in wetlands, thereby extending hydroperiods. The Loop Road/Paces Dike rehabilitation project would remove the impoundment effect of the road and tend to speed up the rate of surface water discharge to more natural conditions for the area of Everglades between Gator Hook Strand and East Slough, approximately 150,000 acres. Other actions proposed by the National Park Service would be unlikely to affect surface flows to Everglades National Park.

Past, present, and future oil and gas development, along with other types of development outside the preserve, could have minor total impacts on surface water flows on an individual basis, but significant impacts collectively. Care would have to be taken to mitigate these potential impacts by requiring adequate culverting, avoidance of high-flow areas (such as strands), and development that would be positioned in ways to reduce impacts. Cumulative analyses for plans of operations, which are required by the 36 CFR 9B regulations, would identify problem areas and help the National Park Service in reducing impacts.

IMPACTS ON WATER QUALITY

Analysis. Under the proposed action one of the greatest threats to water quality would be from continued oil and gas operations. Current operators in the preserve have cooperated in efforts to limit environmental damage, and NPS oil and gas regulations and procedural requirements contained in 36 CFR 9B and the minerals management plan, as well as regulations enforced by other agencies, are intended to eliminate releases of pollutants into the environment from petroleum activity.

Past geophysical activities have affected 474 miles (858 acres). Anticipated future geophysical activities, which could be proposed anywhere in the preserve, would affect an additional 433 miles (524 acres). Water quality could be affected by increased turbidity due to drilling and driving vehicles along seismic lines, changes in pH due to limestone cuttings and bentonite, and motor oil and other contaminants given off by vehicles and equipment. These effects would be mitigated by requirements of the minerals management plan that would seek to protect water quality. Groundwater disruption from shot-hole drilling and explosions could affect water quality. The potential for contamination of the shallow, freshwater aquifer by subsurface saltwater would be mitigated by limiting the depth of and controlling the spacing between shot holes.

Oil and gas drilling and production operations involve working with large volumes of caustic and toxic fluids; accidental releases are inevitable, and the risk of spills under the proposed action would continue. Releases would consist of spills of transported materials, leaks in pipelines or tanks, leaching of improperly contained materials from a pad, subsurface leaks in well casings, and wastewater subsurface injection. The probability of a major spill is much greater during drilling activities than during other operational phases. Pressures greater than those expected may be encountered (especially in the unproven areas off the Sunniland trend) and may exceed the capabilities of blowout preventers. Tanker trucks are used to transport crude oil from the well before the construction of pipelines. These tankers have been involved in accidents that have released oil and brine water into the natural systems of the preserve. Two tanker truck accidents in the preserve have occurred in the past 7 years, releasing a total of approximately 1,500 gallons of oil into the environment. Spills occur rather frequently in the preserve, but it is the quantity of contaminants released, rather than the actual number of spills, that is important. For example, during a 19-month period in 1985-86, spills and leaks from pipelines, storage tanks, and well heads were reported, ranging from under 10 gallons to over 6,000 gallons. A pipeline break in 1986 in conservation area 3A east of the preserve went undetected for several days and contaminated about 100 acres with produced oil before the spill was contained and removed. With proposed management of oil and gas in the preserve, the risk of such a large spill would be low but would remain a potential threat to water quality.

In addition to surface water, spills can also contaminate groundwater, particularly if the spill occurs on dry ground. An investigation of groundwater quality impacts was conducted in Big Cypress after an accidental discharge of produced waters from a mud retention pit in the Raccoon Point field in 1984. The study indicated that shallow groundwater in the root zone (0.4 meter below ground surface) 90 meters from the retention pit would contain more than 500 milligrams of chloride per liter (mg/l) of water during the dry season for at least three years following the spill. Chloride concentrations of 500 mg/l or greater can kill cypress trees, and a 3-acre dead zone resulted from the spill, with an additional 7 acres of cypress trees exhibiting abnormal basal sprouting as a result of apparent stress (NPS, Roy et al. 1987).

Groundwater could also be polluted by leaching of spilled or improperly stored fluids on pads. A study of leaching from mud retention pits in the preserve documented that groundwater at 2.7 meters below the surface was polluted by chlorides downgradient from the pit. Thirty meters from the pit chloride levels in groundwater reached a high of 690 mg/l nine months after the pit was initially used; within 10 meters of the pit groundwater chloride peaked at 1,190 mg/l (NPS, Roy et al. 1987). Because of their tendency to leach pollutants, mud retention pits are no longer allowed in Big Cypress in favor of containerized retention systems, but this past experience with leaching illustrates the potential problem with accidental releases on pads or uncontrolled materials storage. Although low, the risk of such an occurrence would increase as the number of wells and production pads increased. In the event of spilled or leached pollutants reaching groundwater, pollutants would assume the direction of lateral flow, making cleanup extremely difficult and costly.

Pollutants most likely to be involved in spills, leaks, or leaching would be crude oil and brine, but contamination could also result from other well fluids, drilling fluids, cement, chemical dispersants, acidizing and fracturing fluids, production chemicals, and construction materials and wastes. The use of containerized systems and drip pans under drilling facilities would continue to keep the potential for adverse effects from many of these contaminants low.

Drilling into pockets of oil or gas that are in natural equilibrium with the subsurface geologic environment could introduce oil or gas into other sedimentary zones if the well casing broke. It is unlikely that pressures on the Sunniland trend are high enough for a well blowout. Below the Sunniland formation and off the trend, formation pressures are unknown. The most probable reason for a casing failure would be faulty installation or corrosion of the casing by strong brine solutions.

Even though these types of failures would be unlikely, the leakage of hydrocarbons into other strata could cause several underground impacts. If a casing ruptured, crude oil, natural gas, and brines would be introduced into the groundwater system. Oil and gas would migrate upward to a local stratigraphic trap or possibly to the surface. Potable groundwater supplies, which are only 20 to 30 feet below the surface, would most likely be affected by surface spills of hydrocarbons, brines, or other chemicals and not by subsurface leaks. If droplets of oil or escaping natural gas percolated into the groundwater, the odor and taste would be affected, and a visible oil film might result.

The leakage of hydrocarbons at or below 500 feet would probably cause some contamination of the Floridan aquifer, or other deeper groundwater zones. However, water at these depths is naturally high in dissolved solids and is not potable. Even though thick strata of low permeability overlie the Floridan aquifer, incidents have occurred where brackish water under artesian pressure has flowed upward along well bores and seeped outward to contaminate portions of shallow freshwater aquifers. Normally, this problem would be controlled by proper casing and plugging of wells.

The amount of groundwater used for drilling operations in the preserve can be very large. South Florida Water Management District regulations limit the volume of groundwater extracted from any one drilling site to 0.7 million gallons per day. The average volume of freshwater extracted from shallow wells for one producing oil well during an average 45-day drilling operation in the preserve is 1,323,000 gallons (Palmer, personal communication, Exxon 1987). Once used, the wastewater is then pumped into the "boulder zone," an unconsolidated formation found between 1,800 and 4,000 feet belowground. The impacts on the aquifer from freshwater removal and from wastewater discharge into the boulder zone are unknown.

Temporary, localized turbidity would be produced during geophysical operations and road, pad, or pipeline construction or reclamation. Natural levels of turbidity in the preserve are low. Mitigating stipulations in the minerals management plan (see appendix C) would control the extent of turbidity, and no serious threat to overall water quality is expected.

Past drilling and production activities have displaced 259 acres, and future development could displace an estimated 203 acres. Adverse water quality impacts, such as turbidity, sedimentation, spills of contaminants (such as production fluids, crude oil, and brines), water use (related to contamination of the aquifer), and construction wastes could occur in an area of 1,000 feet on any side of a development, as discussed in appendix B.

Under the proposed action potential water quality impacts of petroleum drilling and production operations could occur throughout the preserve. Even though possible, for operations north of US 41 it would be highly unlikely that water-borne, petroleum-related pollutants would reach the Loop or Stairsteps unit or Everglades National Park before they could be contained. However, if any operations were placed below US 41, the containment of pollutants before reaching Everglades National Park would be very difficult. Methods for protecting water quality and contingency planning for spills would be generally addressed in the minerals management plan. Due to the proximity to Everglades National Park, case-specific stipulations would be applied to plans of operations for development in the Stairsteps and Loop units.

Proposed visitor services and development actions are expected to alleviate several water quality impacts. Providing toilets and sewage dump stations for recreation vehicles at six designated campgrounds along major roads would almost eliminate illegal sewage dumping believed to be occurring at existing, undeveloped campgrounds. The preserve staff estimate that visitors could be illegally discharging a total of as much as 6,000 gallons of raw sewage per year into borrow ponds or the surrounding area at five campgrounds. Providing sanitary facilities would remove the reason for illegal disposal, and the proposed reorganization of the campgrounds would allow improved monitoring and enforcement efforts.

Water quality could improve slightly over the current condition as a result of proposed backcountry use management. Sewage at the 50 proposed backcountry shelters would be contained in pit toilets on higher, dry ground and vault or other self-contained toilets in wet areas. Even though some increase in bacterial or other organic pollution is possible, with proper design, installation, and occasional monitoring of water conditions, water quality is expected to meet state standards for recreational use. Backcountry users would be informed primarily through handout publications of proper ways to dispose of waste at designated and undesignated backcountry camping sites without toilets. It is expected that low use in such areas would not pose a threat to water quality; however, if a water problem was identified, either toilet facilities would be provided or the site would be closed to camping to allow recovery.

The use of ORVs in the preserve would result in continued, very localized turbidity of water along ORV trails. Existing trail mileage would be reduced by about 20 percent, and impacts would be so localized as to pose no serious threat to overall water quality (Duever et al. 1986b).

New facility construction and preserve operations would have little effect on water quality. NPS fill operations would comply with the requirements of section 404 of the Federal Water Pollution Control Act, section 10 of the Rivers and Harbors Act, chapters 17-3 and 17-4 of the Florida Administrative Code, and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods; the worst effect would be temporary localized siltation. Parking areas and other developed sites would be designed to allow storm water to percolate into the soil rather than running off directly into adjacent wetlands, thus helping to protect water quality in these localized areas. Operation of NPS sewage treatment and solid waste disposal systems would continue to comply with federal and state regulations and would not pollute adjacent surface water or groundwater resources.

NPS storage and handling of automobile and aviation fuels, pesticides, and other potentially hazardous materials would be conducted according to NPS, EPA, OSHA, and state regulations to avoid unnecessary releases into the environment. No major spills have occurred at NPS sites to date. Spills of pesticides have been minor, amounting to less than 0.5 quart spillage per year. Pesticides are transported in multiple containers for safety, and rarely are more than 5 gallons transported at any time. Pest management staff receive monthly training updates in pesticide handling. With the current program impacts from accidental releases are expected to be negligible.

Continued application of pesticides, particularly herbicides for melaleuca, Australian pine, and Brazilian pepper control, would unavoidably increase pesticide levels in adjacent surface water and groundwater. Concentrations of pesticides in surface water and groundwater would be systematically monitored, and applications would be adjusted to ensure that levels are below allowable standards.

Proposed actions to rehabilitate the Turner River and Deep Lake Strand drainages and to improve surface flow under the Loop Road and Paces Dike could change the alignment of the saltwater/freshwater gradient in the southern portion of the preserve.

Possible future action to re-culvert the Bear Island Road would be determined after a water quality study of the Okaloacoochee Slough has been conducted. There is concern that water quality could be jeopardized by existing rock pits, landfills, and petroleum developments and by future agricultural expansion in the Okaloacoochee drainage north of the preserve. At present about 4,000 acres of the extreme northwestern corner of the preserve are in the Okaloacoochee Slough. If the re-culverting was to be carried out, roughly 7,000 additional acres in East Hinson Marsh would receive Okaloacoochee water during high water periods (see "Impact on Surface Water Flows" for the proposed action). Under the proposed action this more natural flow would only occur if water was of sufficient quality.

Conclusion. Overall impacts to water quality are expected to be less than those under the status quo alternative. Important concerns include localized accidental releases of petroleum-related pollutants, an increased but low risk of a major petroleum spill, and curtailing of current illegal sewage discharges at existing campgrounds. If oil and gas operations occurred south of US 41, there would be an increased risk of water quality degradation in Everglades National Park. Up to 433 miles could be affected by geophysical activities (524 acres) and exploratory drilling and production (203 acres), resulting in possible water quality impacts.

Cumulative Impacts on Water Quality. Both surface water and groundwater in south Florida are unusually susceptible to contamination because of the region's high water table, shallow aquifers, and the low filtering capacity of the highly porous substrates. Threats to water quality in the region include oil and gas exploration and development, the use of agricultural fertilizers and pesticides, the growth of urban areas, sewage effluent, industrial pollution, saltwater intrusion, and excessive water use.

Agriculture and urbanization are rapidly expanding, and the dependence on groundwater and the discharge of wastewater grows with them. The Southwest Florida Regional Planning Council estimates that domestic groundwater use in Collier and Hendry counties will increase by over 100 percent by the year 2000 to 54 million gallons annually. If agricultural demand keeps pace with domestic demand, total water use by 2000 for the two counties would exceed 500 million gallons a year. Further, sewage effluent in the six-county southwest Florida region is expected to be 115 million gallons per day by the turn of the century (Southwest Florida Regional Planning Council 1987).

Because the original boundaries of Big Cypress National Preserve enclose a watershed, possible water contamination on adjoining lands cannot reach very far into the interior of the preserve. As previously described, there is some exchange in the western Bear Island and Deep Lake units through Okaloacoochee Slough, affecting about 5 percent of preserve lands. Agricultural fertilizers and pesticides, and to a lesser extent petroleum-related contaminants, are potential pollutants entering through Okaloacoochee Slough. Of special concern is the trend toward converting improved pastures, vegetation fields, and native range in the Immokalee area to citrus groves. Several thousand acres of land there have already been converted, and over 100,000 acres are under permit for conversion. Problems with chemical pollutants, such as ethylene dibromide, have occurred on other citrus lands in Florida. The proposed action would provide a monitoring system within the preserve for responding to external surface water quality problems, should they occur.

In a similar situation, groundwater quality within the preserve could be adversely affected by agricultural developments near the preserve boundary. Groundwater flow patterns are not yet well understood, and the extent of the potential threat, if any, is unknown.

A potential, long-term groundwater problem in Big Cypress could result from increased urban growth along the Gulf coast in the Naples area, if water management follows the pattern of the Miami area. Miami has been plagued by saltwater intrusion and urban and industrial pollution of municipal water wells along the east coast. Consequently, well development is moving farther inland toward Everglades National Park as water demand increases. If this pattern occurred on the west coast as a result of explosive, unplanned growth, future municipal wells near the preserve boundary could conceivably cause a drawdown of the water table, resulting in potential major hydrological and ecological changes in the preserve. However, this scenario is unlikely because of steps now being taken in the region to plan urban growth and to protect aquifer recharge areas.

The proposed action, by protecting water quality in the preserve, would beneficially contribute to the overall water quality of shallow aquifers that are so important to the human environment of the region.

IMPACTS ON CYPRESS STRANDS / MIXED-HARDWOOD SWAMPS / SLOUGHS AND CYPRESS DOMES

Analysis. Cypress strands, mixed-hardwood swamps, sloughs, and cypress domes are vegetation types associated with relatively permanent water in the preserve. They have in common long hydroperiods, long intervals between fires, and deep organic soils. Even though they differ in species composition and structure, management of these types is functionally similar. Therefore, they are considered together for the purposes of impact analysis.

Roughly 11,000 acres of strands, swamps, and sloughs would be better maintained by the proposed Turner River / Deep Lake Strand and Loop Road / Paces Dike hydrological restoration projects. As a result, more natural hydroperiods would be reestablished: Hydroperiods would be increased on about 5,000 acres and reduced over about 6,000 acres. The effects would be subtle and long term, affecting the internal structure and composition of strands rather than causing obvious shifts in the distribution of strands/swamps/sloughs. For instance, in cypress strands where hydrological restoration would result in extended hydroperiods, the establishment of cypress seedlings in the understory and pines or other shorter-hydroperiod invaders would diminish, leading to the long-term maintenance of the cypress overstory (Alexander and Crook 1975).

Proposed actions to reduce the mileage of ORV trails in strands/swamps/sloughs would allow recovery to more natural conditions for a portion of existing trails. To quantify impacts of proposed ORV management actions on these and other important vegetation types, areas that would be affected were estimated from the Existing ORV Trails map (see "Affected Environment") and the Important Resource Areas map (see "Planning Perspective"). Estimated trail lengths were multiplied by an average trail width of 15 feet (ORV trails vary in actual width from 6 feet to over 50 feet in some locations). The estimated areas given below are conservative since only the wider, more heavily used trails were mapped because of the small scale of the aerial photography and because trails were obscured by canopy vegetation in strands/swamps/sloughs, pinelands, and hardwood hammocks. Therefore, the acreages are given as a minimum estimate, and they provide a general sense of the extent of area that would be affected. By this method roughly 30 miles, or 55 acres, of cypress strand/mixed-hardwood swamp/slough would recover over a period of several years under the proposed action. A study of abandoned ORV trails in Big Cypress found that after seven years former trails through cypress strands tended to have a dense ground cover of herbaceous plants (genera included *Bacopa*, *Diodia*, *Ludwigia*, and *Proserpinaca*) as a result of the forest canopy opening created by the trail (Duever et al. 1986b). Such sites would eventually succeed to the condition of the surrounding swamp.

The proposed fire management program would maintain the approximate distribution of cypress strand / mixed-hardwood swamp / slough and cypress dome communities in the preserve. These communities are normally too wet to burn, particularly mixed-hardwood swamps and sloughs, which carry fire only during extreme drought. Cypress strands and domes burn infrequently, and incidental fires from prescribed burning would likely be sufficient to maintain cypress dominance (Forest Service, Wade et al. 1980a).

Cypress strands / mixed-hardwood swamps / sloughs and cypress domes have been invaded by melaleuca in areas near the Loop Road and near Trail Center on US 41. About 15 acres have been densely infested, while an additional 2,550 acres contain widely scattered clumps of the exotic. The proposed expanded exotic plant program would reduce and better control the spread of melaleuca. Because melaleuca seedlings are susceptible to flooding, restoration of more natural, increased hydroperiods south of the Loop Road would probably aid in reducing the spread of melaleuca on over 1,000 acres of strand/swamp/slough and dome communities.

Proposed controls on geophysical activities for oil and gas production would protect strand/swamp/slough and cypress dome communities from vehicular access to prevent vehicle ruts and vegetation damage (see appendix C). Not only is this resource area extremely important for continued water flow to Everglades National Park and for threatened and endangered species habitat, but it is also the most sensitive to seismic disturbance in terms of the percentage of vegetation damaged and killed, as shown by Fountain and Rayburn (1987) in a similar environment in Big Thicket National Preserve, Texas. Drilling and production activities would be prohibited in these communities. There would be a somewhat increased, but low, risk of impact from petroleum-related spills or leaks on adjacent lands.

Proposed NPS development would occupy an estimated total of 1.5 acres of cypress strand and mixed-hardwood swamp. The losses would occur because of proposed interpretive trails at Kirby Storter Roadside Park and along Loop Road. In both cases the disturbance would be mitigated by the opportunity for visitors to better understand and appreciate such communities.

Conclusion. The proposed action would support the long-term health and maintenance of cypress strand / mixed-hardwood swamp / slough and cypress dome communities in Big Cypress.

Cumulative Impacts on Cypress Strand / Mixed-Hardwood Swamp / Slough and Cypress Dome Communities. There have been large-scale losses of these wetland communities in the south Florida region since the 1920s when major drainage projects, urbanization, and agricultural expansion began. In recent years, however, considerable attention has been focused on the value of maintaining wetlands, and wetlands are now protected from direct development by local, state, and federal regulations. Consequently, the rate of destruction of strand/swamp/slough and dome communities on privately owned land is expected to slow. With continued expansion of urban developments in upland sites along the I-75 corridor and the accelerated conversion of pasturage and row crops to citrus groves north of the preserve, some degradation of strands/swamps/sloughs and domes would probably continue outside the national preserve and other protected lands.

The proposed action would help maintain about 1,500 acres of strand/swamp/slough that extend south from the preserve into Everglades National Park by protecting the delivery of surface water to those areas. There would be no other direct effects from the proposed action outside the preserve boundaries. The proposed interpretive program would result in indirect beneficial effects by furthering public awareness of and support for wetlands protection.

IMPACTS ON MARSHES

Analysis. Based on a rough estimate of the impoundment effects of the Loop Road (Sikkema, personal communication 1987), proposed improved drainage under the Loop Road could restore longer, more natural water flows to as much as 6,000 acres of marshland in the Stairsteps unit. Increasing the hydroperiod would cause subtle shifts in the composition of the sedges, rushes, and grasses, favoring wetter marsh species such as sawgrass and maidencane over prairie species such as muhly grass and sand cordgrass. Extending the hydroperiod also tends to slow the invasion of shrubs and palmetto. Melaleuca is among the invaders; about 500 acres of marsh south of the Loop Road contain widely scattered clumps of melaleuca, and increasing the hydroperiod would probably impede melaleuca seedling establishment and assist in limiting the spread of this exotic. In combination with the proposed expanded exotic control program, melaleuca could be contained or eliminated in marshlands.

Several hundred acres of marsh south of US 41 in the vicinity of Ochopee could receive longer hydroperiods with implementation of the Turner River / Deep Lake Strand hydrological restoration project. A shift in species in that area from sand cordgrass and salt grass to black rush (*Juncus roemerianus*) and spike rush has been reported and attributed to drainage and increased fire frequency (NPS, Bass and Kushlan 1982h). Restoration of surface flows would restore marsh vegetation.

Potential improvement of drainage under the Bear Island Road could slightly extend hydroperiods in the East Hinson Marsh. This action might have some effect on community structure but would not be likely to cause major changes in vegetation distribution.

Proposed ORV management actions would allow the restoration of approximately 120 acres of marsh currently occupied by ORV trails. About 90 acres of the total would come from the Stairsteps units where there is currently an overly extensive, braided network of trails used primarily by airboats and tracked vehicles. Duever et al. (1986b) found that recovery after eliminating use on ORV trails in marshes is a slow process. Seven years after ORV use ended, abandoned trails were still visible and were dominated by grasses of the genus *Eragrostis* rather than the surrounding marsh species. They also found that tracked vehicles used in saturated marsh soils caused lasting vegetation damage, even with very little use. Airboats, the least damaging of ORVs, reduced plant diversity and density along marsh trails when persistently used (Duever et al. 1981). The proposed action would eliminate damage by tracked vehicles and restrict the effects of airboats. Removing wheeled-vehicle use from marshes in the Stairsteps unit would further reduce long-term damage to marsh vegetation.

The proposed expansion of the prescribed fire program would improve the health and continuance of marsh vegetation by periodically removing accumulated organic material, encouraging new growth of marsh species, and suppressing invading trees and shrubs. Several hundred acres would be burned annually. Freshwater marshes would be burned on a three- to five-year rotation; saltwater marshes on the southern edge of the Stairsteps unit are subject to frequent lightning strikes and are relatively self-maintaining (Forest Service, Wade et al. 1980a).

Proposed controls on geophysical activities for oil and gas production would protect this important resource area from vehicular access to prevent trail ruts and vegetation damage, in accordance with stipulations identified in the minerals management plan (see appendix C). If oil and gas operations were to occur south of US 41, there would be a threat to marsh productivity in the Stairsteps unit from altered water flow and decreased water quality (including saltwater intrusion). In the Bear Island unit there would continue to be a low risk of damage to East Hinson and Little marshes from accidental spills or leaks from contaminants originating from activities on existing roads and pads.

Proposed NPS developments would occupy less than 1 acre of marsh vegetation. Less than 0.3 acre would be disturbed along US 41 near Ochopee for a new orientation wayside, and 0.5 acre or less in East Hinson Marsh would be affected by an interpretive boardwalk.

Conclusion. The proposed action would support the long-term health and maintenance of marshes in Big Cypress.

Cumulative Impacts on Marshes. The proposed action would perpetuate a segment of a vegetation type that historically covered much of south Florida. In this century several hundred thousand acres of marshland south of Lake Okeechobee and north of Florida 84 have been lost to agriculture and, to a lesser extent, urban development. There are now federal, state, and local regulations that effectively protect remaining marshes from construction projects. However, marshes currently have little regulatory protection from agricultural expansion, and over the next decade it is likely that several thousand acres of marshland would continue to be lost outside of protected areas in the region.

IMPACTS ON MANGROVE FORESTS

Analysis. The proposed action is expected to have little noticeable impact on mangrove forests in the preserve. The interface of mangrove forest and salt marsh in the southern portion of the Stairsteps unit fluctuates naturally in response to frosts, hurricane damage, fire, and changes in the gradient between salt and fresh water. The proposed action would maintain the natural (primarily self-regulating) fire regime in salt marshes (Forest Service, Wade et al. 1980a). Proposed restoration of more natural surface water flows associated with the Turner River canal and the Loop Road could cause a gradual shift seaward in the mangrove/salt marsh line. The change would be most likely to occur in the vicinity of the Turner River canal and Turner River. These changes would probably be subtle and inconsequential compared to natural fluctuations and long-term landward encroachment of mangrove due to the global rise in sea level.

Stipulations proposed in the minerals management plan with respect to geophysical activities for oil and gas production would prevent vegetation damage or other impacts. If oil and gas operations were to occur south of US 41, there would be a threat to mangrove productivity from altered water flows and decreased water quality.

Conclusion. The proposed action would support the long-term health and maintenance of mangrove forests.

Cumulative Impacts on Mangrove Forests. The proposed action would perpetuate mangrove forests in Everglades National Park south of the preserve. Mangroves in the region are well-protected by stringent state and local regulations. Consequently, the distribution of mangroves in the region would probably not be significantly affected by human influences over the life of the plan.

IMPACTS ON OLD-GROWTH PINELANDS

Analysis. The most important aspect of the proposed action affecting old-growth pinelands would be the expansion of the existing fire management program, particularly prescribed burning. Old-growth pinelands depend on periodic fire to suppress hardwood tree and shrub invasion and to prepare seedbed conditions for pine reproduction. The proposed action, therefore, would perpetuate existing old-growth stands, which total approximately 45,000 acres.

About 50 acres of old-growth pinelands are in areas invaded by melaleuca, primarily south of US 41 near Trail Center. One stand near Pinecrest has been invaded by Australian pine. The proposed action would seek to remove or control these exotics.

The proposed action includes the cleanup of trespass property sites. About 60 current or former trespass properties in old-growth pinelands would be affected. Perhaps 20 of these sites would be used for future public backcountry camping once all structures had been removed. This would result in a net restoration of about 20 acres of disturbed land in old-growth pineland.

Currently, a total of 30 miles of ORV trails through old-growth pineland occupy about 54 acres. Under the proposed action this trail mileage would be reduced by 5 miles, or 9 acres. The study of abandoned ORV trails in the Loop unit found that seven years after use stopped, old ORV trails through pinelands had a dense cover of grass (*Eragrostis* species) and forbs (Duever et al. 1986b). The abandoned trails would eventually succeed to the surrounding forest cover.

The proposals of the minerals management plan to control geophysical activities for oil and gas would restrict vehicle access in old-growth pinelands to prevent soil degradation, vegetation damage, and impacts to red-cockaded woodpeckers. Drilling and production activities would be prohibited in old-growth pinelands so no direct impacts should occur. However, oil and gas developments could impact younger stands of pines, thus possibly reducing available red-cockaded woodpecker habitat over the long term.

Conclusion. The proposed action would perpetuate existing old-growth pinelands in the preserve.

Cumulative Impacts on Old-Growth Pinelands. Because of their importance as red-cockaded woodpecker habitat, old-growth pinelands are well protected on federal and state lands in southern Florida. However, on private lands, primarily in Collier and Hendry counties north and west of the preserve, there is little or no protection, and it is likely that the few remaining stands of old-growth pinelands would continue to diminish over the coming years as a result of urbanization, agriculture, and lumbering.

In the long-term, 20 to 30 years from now, existing second-growth pinelands in Big Cypress, Everglades National Park, Fakahatchee Strand State Preserve, and other conservation areas will reach maturity, more than doubling the current acreage of pinelands over 60 years old.

IMPACTS ON HARDWOOD HAMMOCKS

Analysis. The proposed action would protect hardwood hammocks in the preserve. Proposed fire management policies would improve hardwood hammock protection from wildfires by managing fuel loads in surrounding fire-dependent vegetation. Loss of some hammock vegetation to fire during extreme drought years would probably remain as an inevitable, but natural, occurrence.

Debris would be cleaned up from about 80 trespass properties to be removed from hammocks on federally owned land, representing approximately 40 acres of disturbed land. An additional 65 trespass properties have been removed in the last 10 years, but many of these were simply burned and the debris left in place. The proposed action would allow eventual recovery of the affected hammocks. However, as many as 30 would still be used for public backcountry camping, allowing continued disturbance to about 15 acres of hardwood hammock vegetation.

The proposed limitation on ORV trails in the preserve would allow the recovery of about 8 acres of hammock vegetation – 4 acres in the Bear Island unit and 2 acres each in the Deep Lake and Corn Dance units. A study of abandoned ORV trails in the Loop unit of the preserve found that after seven years former trails through hammocks were densely covered by groundsel tree (*Baccharis* spp.), a native woody shrub. Closed trails would eventually succeed to the surrounding vegetation.

About 1 acre of upland hardwoods would be occupied by proposed NPS development. Approximately 0.25 acre of vegetation would be removed to construct the proposed East Hinson Marsh interpretive walk in the Bear Island unit and less than an acre of second-growth hardwoods would be removed for the proposed Red Bird Lane campground. The proposed hardwood hammock interpretive walk at Pinecrest would use an existing trail. At the East Hinson Marsh interpretive walk, there would be an increased risk of wind damage to the hammock vegetation. Craighead (1974) reported that wind damage to Mahogany and Royal Palm hammocks in Everglades National Park during Hurricane Donna in 1960 appeared to be concentrated along interpretive trails. Craighead theorized that the trails created canopy openings that impaired the hammocks' ability to deflect wind. Care would be taken in the construction of the proposed trails to leave the forest canopy intact.

About 100 acres of hammock vegetation are within the areas of the preserve with scattered melaleuca stands. Undisturbed hammocks with closed canopies are rarely susceptible to melaleuca invasion, but disturbed sites may be invaded. The proposed expansion of exotic plant control would help protect disturbed hammocks.

Proposed controls on oil and gas geophysical operations, as proposed in the minerals management plan (see appendix C), would protect hardwood hammocks from vehicle access, thus preventing trail ruts and vegetation damage. Drilling and production activities would be prohibited in these communities, so there would be no direct impact. Also, the topographic elevation of hammocks reduces the risk of major impacts due to spills or leaks.

Conclusion. The proposed action would generally protect hardwood hammocks in the preserve.

Cumulative Impacts on Hardwood Hammocks. Unlike wetlands, upland vegetation such as hardwood hammocks have little regulatory protection in the south Florida region. Even though hammocks would continue to be protected on public lands, including Big Cypress National Preserve, losses of hardwood hammocks on private lands north of Florida 84 and in portions of Dade County and the Florida Keys would be likely to continue because of urban and agricultural development.

IMPACTS ON FLORIDA PANTHERS

Analysis. The proposed action could directly affect the survival of individual Florida panthers and indirectly affect the long-term health and recruitment of the population through habitat changes. Known direct effects have included mortality or injury to panthers due to traffic accidents, illegal shooting, and accidental drug overdoses during capture for research. Under the proposed action steps would be taken to better protect the panther. Indirect effects would depend on the quality of habitat resulting from the proposed action. Habitat quality is assumed to depend on the condition of the panther prey base and the degree of human intrusion into panther habitat. Direct and indirect effects are discussed below.

The risk of traffic-related panther mortalities could be reduced slightly by the proposed action. Between 1980 and 1986, 12 panthers were killed on highways in and around Big Cypress. These incidents are assumed to be a result of the frequency of panthers crossing highways, the volume of traffic, traffic speed, and driver alertness. The construction of I-75 and its associated wildlife underpasses (an action that is beyond the scope of this plan) is expected to significantly reduce panther mortality along the highway corridor and in the Bear Island area by reducing the frequency of panthers crossing the roadway in traffic. It is unlikely that the frequency of panthers crossing other roads would be influenced by the proposed action, and traffic volumes along US 41 or Florida 29 are not expected to be altered by the proposed action. However, driver alertness and control of traffic speed along US 41 would be modestly improved through proposed interpretive programs dealing with the panther and the cooperation of the NPS and state law enforcement agencies for speed limit enforcement. Therefore, the frequency of panther accidents on US 41 could be reduced over the current rate of one accident every four years. Traffic volume and speed would increase on the Loop Road as a result of the proposed upgrading, but the design speed would be low (35 miles per hour), and driver alertness high because of the interpretive function of the road. Consequently, the overall risk to panthers is expected to be slightly reduced, primarily because of increased driver awareness and traffic control on US 41.

The risk of illegal shooting of panthers would probably decrease as a result of proposed actions. Illegal shootings are assumed to be primarily a function of the frequency of encounters between panthers and armed individuals. Three panthers were illegally shot in south Florida between 1981 and 1986 (that is, one panther death every 1.6 years). Proposed restrictions on hunting seasons, numbers of hunters, and use of dogs and ORVs in known panther areas are expected to reduce the frequency of human encounters with panthers. Improved monitoring on designated trails and better game law enforcement would also help discourage such illegal shootings.

The proposed plan would probably not reduce the risk of accidental deaths of panthers from research activities. One panther death between 1981 and 1985 was caused by a drug overdose while a panther was being tranquilized for research purposes (that is, one panther death every four years or longer). There are three factors relating to overdoses: the potential toxicity of the drug used, the particular sensitivity of the panther involved, and the ability of the researcher to estimate the appropriate dosage. Immobilizing drugs have been improved in recent years to allow more latitude in dosage without endangering the target animals, and the ability of researchers to safely use drugs has improved with training and experience. Furthermore, a veterinarian now accompanies each field team to administer medical attention if required. Consequently, the risk of overdoses has decreased significantly and tranquilizing procedures are now considered quite safe. However, continuing field research involving tranquilizing drugs carries with it the unavoidable risk of death or injury to panthers from overdoses or other accidents. The threat of accidental death is offset by management information gained and the opportunity to administer veterinary care to individual panthers during their brief captivity. In the long term the Florida panther population would benefit from proposed research despite the short-term risk to individual panthers.

The proposed action would indirectly affect panther health, survivorship, and reproduction and recruitment. It would increase the prey base for panthers, particularly white-tailed deer and feral hogs. Proposed hunting limitations – including a full-season quota on the numbers of deer and hog hunters, a reduction in the use of dogs for deer and hog hunting, and a limitation on the use of ORVs for hunting (for example, ORVs would be restricted to designated trails in known panther areas) – are expected to increase deer and hog densities. Furthermore, use of prescribed fire and control of melaleuca would help improve the quality of prey habitat (see "Impacts on White-tailed Deer and Feral Hogs").

Disturbance to Florida panthers from continuing recreational and commercial activities in Big Cypress has not yet been investigated. The effects of such disturbance are difficult to quantify but are potentially far-reaching. Disturbance for the purposes of this document is defined as the condition where wildlife alter their behavior or metabolism because of seeing, smelling, hearing, or otherwise sensing humans or human artifacts or structures. The general effects on wildlife are briefly discussed below, followed by an assessment of the potential effects of the proposed action.

Most wildlife studies have dealt with the effects of noise and general human presence on animal behavior. Such studies indicate that factors affecting animal response to disturbance include the intensity of the stimulus, the frequency of the stimulus, the experience of the animal in association with the stimulus, the condition of the animal at the time of disturbance (for example, the animal's nutritional condition or reproductive status, social grouping, or the presence of young), and environmental conditions (for example, proximity of cover and wind direction; Altmann 1958). Perhaps the most important of these factors is the frequency of the stimulus and the animal's association from past experience. Many wildlife species are able to habituate to even high levels of noise or other disturbance if the disturbance is fairly consistent, it is relatively stationary or at least contained in a defined area, and the animals do not associate the disturbance with an adverse effect (Geist 1975a and 1975b). A common example of habituation and association is the behavior of deer in an unhunted refuge versus an area managed for hunting. In unhunted refuges deer may lose their initial fear of humans and ignore human presence; in some cases deer may even associate humans with food handouts and consequently become a nuisance in campgrounds and along roads. In hunting areas, however, deer and other wildlife are more often wary of humans, apparently because of a learned experience and associated threat (Ream 1979; Behrend and Lubeck 1968).

Wildlife responses to disturbance that have been documented in the field, although not specifically in south Florida, are behavioral and metabolic. Behavioral responses relate primarily to movement, including remaining motionless to avoid detection, seeking cover, aggressively approaching the stimulus, or abandoning an original home range or denning site. Metabolic responses occur simultaneously with behavioral responses and include increased heart rates and possibly other stress-related physiological effects (Ward 1980; MacArthur et al. 1979). The secondary effects of altered behavior or metabolism due to disturbance vary. If the disturbance is infrequent, regular, or nonthreatening, then the overall effect on the health and condition of wildlife may not be adverse. However, if the disturbance is widespread and is perceived by wildlife as a menace, then secondary effects can significantly affect wildlife condition, mortality, and reproduction (Geist 1975b; DeForge 1976). A New Zealand study, for instance, showed a decline in productivity in wildlife populations during intensive hunting because the animals had restricted themselves to cover that had low food value (Batchelor 1968).

Florida panthers are believed to be sensitive to human intrusion into their habitat, and the decline of the Florida panther has been attributed to the loss of habitat quality due to increasing hunting, ORV use, and other backcountry recreation; petroleum operations; road construction; agriculture and urbanization; and other human activities (FGFWFC 1985c; USFWS 1987a). Studies of disturbance effects on another subspecies of *Felis concolor* in Arizona and Utah found that resident mountain lions altered their home range and home area to avoid logging activity and logged areas (Van Dyke 1983; Van Dyke et al. 1986a). Further, the mountain lions altered their activity patterns to avoid human contact by shifting their peak activity to periods of darkness and avoiding the normal peaks of dawn and dusk. Lions appeared to select home ranges where timber sale areas were absent, road densities were lower than average, and there were few or no permanent human disturbance sites, such as residences. The study concluded:

> First, areas that experience permanent or repeated habitat alteration are reduced in quality to the lion population, even if human residence, presence, or activity is temporary. Second, areas where there is continuing, concentrated human

> presence or residence are essentially lost to the lion population, even if there is little impact on the habitat itself (Van Dyke et al. 1986a).

This indicates a very low tolerance to human activity by western panthers. Although the results of studies in Utah and Arizona cannot be directly applied to the Florida panther subspecies, such studies suggest that human disturbance in panther habitat should be managed cautiously.

The proposed action would not remove human disturbance from panther habitat in the Big Cypress, but it would reduce or contain disturbance effects compared to the current condition. The greatest reductions in disturbance in known or potential panther habitat would be due to reductions in hunting and ORV use, activities that are mobile and that are therefore widespread in their potential impacts. The level of hunting would be reduced by initiating a full-season quota and terminating the use of dogs in four additional units. The effect of dogs on panther activity has not been specifically studied, but it is believed to be a potential problem because of dogs' aggressive pursuit, noise, and ability to penetrate cover difficult for humans to access (thereby expanding human-related disturbances). The full-season hunting permit quota is also expected to reduce ORV use in general, and the proposed restriction of ORV trails in the Bear Island, Turner River, and Corn Dance units would reduce the spatial extent of disturbance in those units. Hiking, another mobile use, would be mostly limited to the Florida National Scenic Trail, and it is not expected to be a major influence on panther activity. Restricting backcountry camping in known panther areas is intended to contain human disturbance, particularly during the evening and morning hours when panthers are most active.

Proposed actions that would create relatively stationary disturbance effects include frontcountry visitor use, administrative facilities, and oil and gas drilling and production operations. Disturbance effects of new frontcountry visitor use and administrative facilities, which would total about 6 acres of new disturbance, would probably not result in any further disturbance to panthers because new facilities would be located along existing road corridors or in developed areas. Potential disturbance to panther habitat related to oil and gas activity would increase under the proposed action because further oil and gas development could occur. However, the level of future petroleum development would be more contained under the proposed action than under current trends projected for the status quo alternative. Disturbances related to oil and gas operations would affect an estimated 57,000 acres (see the discussion of the probable scenario under the "Proposed Action" section). The disturbance would be long term, and the effect on panthers is unknown. Some alteration of panther home ranges would be likely to occur with future petroleum operations. Oil and gas developments would not be permitted in cypress / mixed-hardwood swamps or hardwood hammocks, which are believed to be prime panther habitat (USFWS 1987a).

Subject to the restrictions on vehicles proposed in the minerals management plan (see appendix C), geophysical activities would be permitted in known panther areas, including cypress / mixed-hardwood swamps and hardwood hammocks. However, any such activity would have to be in compliance with the provisions of the Endangered Species Act. The degree of impact from geophysical operations on wildlife depends on the number of concurrent programs and spacing of lines, and the length of time spent in essential habitats. Two aspects must be considered: the immediate effect of exploration activity and the subsequent effects of increased access (Stubbs and Markham 1979).

Certain impacts of geophysical activities might not be easily mitigated and could intensify effects on wildlife. First of all, crews are constantly moving and cover a large area, making it difficult for animals to habituate to their presence. Furthermore, blasting noise is sudden and unpredictable, and its effect may extend beyond the area of immediate surface disturbance. Exploration activities may be especially disruptive if poorly planned and subcontracted to small companies with restricted budgets and without the means to take adequate protective measures (Klein 1972). Helicopter use in geophysical operations, as has been required in the preserve to minimize impacts to vegetation, soils, and water, could also affect panthers. Studies have shown that helicopter use disrupts wildlife. Kushlan (1979) described the effects of helicopters on wading birds, and Barry and Spencer (1976) described that low-flying helicopters appeared to be the most disturbing factor in oil-drilling operations, directly affecting a circle with at least a 1.5-mile radius.

Conclusion. The proposed action would generally reduce the present risk to panthers and would potentially improve the health and survivorship of individual panthers and support increased reproduction and recruitment. Human activity would continue in panther habitat but at reduced levels compared to those that would result from current trends without the proposed action. However, it is important to note that oil and gas exploration and development might increase substantially, resulting in possible increased impacts to panther populations.

Cumulative Impacts on Florida Panthers. The odds for the long-term survival of the Florida panther in the wild are not good. The human population in the region continues to increase, resulting in urban growth and expansion of the regional highway network into former panther habitat. The demand and use of panther habitat for outdoor recreation has also increased and will continue to do so. Trends in agriculture are toward more intensively managed systems, such as citrus orchards (which decrease habitat for panther), and away from grazing and other low-intensity management systems that are less destructive of panther habitat. Petroleum development in the region has grown significantly in the past 20 years and will probably continue to contribute to the human occupation of former panther range north of the preserve.

In addition to habitat loss, the numbers of Florida panthers known to remain in the region are precariously low, probably less than 30 animals, and the health and condition of many of the remaining individuals is poor. There is concern for the genetic viability of the surviving population.

There are, however, reasons for guarded optimism about the ultimate survival of the Florida panther. Cooperation for panther management among the Florida Game and Fresh Water Fish Commission, the Florida Department of Natural Resources, the National Park Service, the U.S. Fish and Wildlife Service, and other resource agencies has been improving. The Florida Panther Interagency Committee, formed in 1986, and the revised recovery plan for the panther published in 1987 will better coordinate panther protection programs. Federal legislation has been passed, and efforts are underway at the state and federal levels to increase public ownership of panther habitat by almost 200,000 acres, including the 146,000-acre expansion of Big Cypress National Preserve.

Equally important, the Florida Game and Fresh Water Fish Commission is involved in the captive breeding of panthers to sustain the gene pool and to eventually return offspring to the wild.

The proposed action is in keeping with the revised recovery plan and would make an important contribution to the concerted work in the region to save the panther. It is probable that the Florida panther would remain in the wild in Big Cypress and adjacent lands over the 10-year life of this plan.

IMPACTS ON CAPE SABLE SEASIDE SPARROWS

Analysis. Approximately 48,000 acres of potential Cape Sable seaside sparrow habitat is in the national preserve, all in the Stairsteps unit. Hydrological alterations in the Ochopee area before the preserve was established disrupted several hundred acres of sparrow habitat and apparently caused a local population decline.

Increased prescribed burning to manage Cape Sable sparrow habitat would improve opportunities for existing populations to expand within the 48,000 acres of potential habitat, and better monitoring of sparrow populations would allow for a more responsive prescribed fire program for habitat management. Proposed research on the sparrow's decline in the Ochopee area could identify future management options to restore sparrow habitat. This rehabilitated habitat (2 percent or less of potential habitat in the preserve) could allow a modest increase in the sparrow population.

Certain geophysical activities would be permitted in sparrow habitat subject to vehicular and other restrictions, as identified in the minerals management plan (see appendix C). All of these activities would, however, be subject to compliance with the Endangered Species Act. Unless mitigated, geophysical activities could have various impacts on sparrows, especially during seasons, periods, or time critical to the species, such as nesting and breeding periods. The disturbance to wildlife discussed previously for the panther would also apply to the sparrow.

Since all sparrow habitat within the preserve is in marshes in the Stairsteps unit south of US 41, no drilling or production activities would be allowed under the proposed action, and no direct impacts should occur relative to these types of activities.

Conclusion. The proposed action would better maintain existing sparrow populations and could ultimately provide for a modest population expansion in the Ochopee area.

Cumulative Impacts on Cape Sable Seaside Sparrows. Based on a 1981 survey (NPS, Bass and Kushlan 1982h), 64 percent of Cape Sable sparrow habitat is within Everglades National Park and 23 percent within Big Cypress National Preserve. Both areas would continue to be managed for the protection of the species. The remaining 13 percent of the occupied habitat is in the East Everglades, an area of private lands between Everglades National Park and the city of Homestead. That portion of the East Everglades subpopulation utilizing habitat north of Florida 27 (about 5 percent of the total occupied habitat) appears to be dwindling, probably due to habitat damage caused by too frequent burning. Approximately 17,280 acres of the East Everglades has been designated as critical habitat by the U.S. Fish and Wildlife Service, and the Florida Game and Fresh Water Fish Commission is now working with private landowners to attempt to coordinate land management to improve conditions for the sparrows.

In summary, the future of the Cape Sable seaside sparrow appears to be secure so long as NPS lands are properly managed for the bird. The proposed action would maintain 23 percent of the total range currently occupied by the sparrow.

IMPACTS ON RED-COCKADED WOODPECKERS

Analysis. The proposed red-cockaded woodpecker management actions would continue to protect 18 known active colonies and perhaps as many as 40 colonies in the preserve (NPS, Patterson and Robertson 1981b). An estimated 130 red-cockaded woodpecker clans would be protected, placing the Big Cypress population in the threatened (rather than endangered) category described in the revised recovery plan (USFWS 1985b).

Geophysical operations would be permitted in woodpecker habitat (old-growth pines) subject to the restrictions on vehicles and other activities identified in the minerals management plan (see appendix C). Stipulations in that plan address measures to prevent damage to the required habitat and to reduce impacts caused by general human presence. Old-growth pinelands would be off-limits to drilling and production operations under the proposed action, so no direct impacts are expected from these activities. Buffers around woodpecker colonies would protect the birds, especially during breeding and nesting seasons, and all activity that might affect the woodpeckers would be contingent on compliance with the provisions of the Endangered Species Act.

General protection of younger pinelands and the proposed prescribed fire program would eventually (in 20 to 30 years) result in more old-growth pinelands becoming available for colonies. Some immature pinelands could be lost to oil and gas development, but the scale of reduction in potential habitat would be unlikely to influence future woodpecker populations.

Conclusion. The proposed action would maintain existing levels of red-cockaded woodpeckers during the life of this plan. Maturing pinelands could eventually allow existing populations to expand.

Cumulative Impacts on Red-Cockaded Woodpeckers. Despite the protection afforded the red-cockaded woodpecker under the proposed action, the long-term prognosis for the species in the region is uncertain. The threat stems from the bird's total dependence on mature pine stands. Pinelands have been heavily exploited throughout the Southeast for the production of pulp and wood products, which require relatively short rotations between harvests. Most mature stands (that is, those over 60 years old) were previously cut, and those that remain are isolated, relict stands. In Florida about half (52 percent) of the relict stands on commercial forestlands are owned by public agencies, which are required under the Endangered Species Act to manage known colony sites for the woodpecker. The other half are on private lands where management is at the discretion of the landowner. A 1983 status report on the woodpecker stated:

> If habitat loss on private lands continues, which seems probable, not only will woodpecker populations on private lands be lost, the existing populations on

> federal lands will be placed in additional jeopardy because federal and other public forests will become increasingly fragmented habitat islands (Lennartz et al. 1983).

Such isolation can lead to a loss of genetic viability and to reproduction failure. Indeed, monitoring conducted by the U.S. Fish and Wildlife Service has documented a slow decline in colony sites in the Southeast.

The U.S. Fish and Wildlife Service is currently researching methods to improve genetic diversity in the species (for example, translocating breeding birds). It is hoped that practical solutions to the genetic isolation problem will be found in the near future. In the meantime, remaining habitat and colonies become increasingly important as a source of genetic stock and as locations for future colony expansion. Therefore, the proposed action would assist in the overall recovery by maintaining existing habitat and colonies. Moreover, the National Park Service would cooperate with future efforts to improve the rangewide survival of the species.

IMPACTS ON BALD EAGLES

Analysis. The proposed action is not expected to affect bald eagles or their habitat in Big Cypress. Known bald eagle nests in the preserve are all in the southern portion of the Stairsteps unit along the salt marsh/mangrove interface. No significant change is anticipated in this area as a result of implementing the proposed action.

Any geophysical activity approved for the Stairsteps unit in the vicinity of known bald eagle nests would be subject to the stipulations identified in the minerals management plan. Operations would not be allowed in or near known nesting areas during the nesting season. If an active bald eagle nest was discovered within 1.25 miles of a proposed geophysical line, activity would be halted during the nesting season (USFWS 1987b). All activity that might affect bald eagles would be subject to compliance with the Endangered Species Act.

Drilling and production operations would be prohibited within 1.25 miles of an active bald eagle nest (USFWS 1987b). Consequently, under the proposed action no direct impacts should occur from this activity.

Conclusion. The proposed action would not affect bald eagles in the preserve.

Cumulative Impacts on Bald Eagles. The bald eagle population in Florida Bay, with nesting habitat in Big Cypress National Preserve, Everglades National Park, Collier-Seminole State Park, and other protected areas along the southwestern coast, has been stable for many years. The proposed action would contribute to the continued stability of the Florida Bay population.

IMPACTS ON *LIGUUS* TREE SNAILS

Analysis. The proposed action would continue to preserve tree snail habitat in hardwood hammocks by preventing new development in hammocks and suppressing wildfires. All hammocks currently known to support tree snail populations would be protected.

Proposed management actions would align NPS regulations governing tree snail collecting with the state's regulations. This would curtail or significantly limit snail collecting in the preserve. The effect of collecting on snail populations is uncertain. Previously, collecting was identified as a major threat to tree snail populations (Pilbry 1946), but experts now believe that habitat destruction is the primary threat (Archy Jones, personal communication 1985).

Continuing the existing prohibitions on transferring color forms between hammocks and introducing new color forms to the preserve would prevent further dilution of genetic integrity and disruption of the natural distribution of tree snails. Even though there has been considerable artificial mixing of color forms and transplanting of tree snails in the past, several hammocks are believed to have original, pure color forms. The proposed action would continue to protect the integrity of these populations.

If predation by exotic animals was determined to be a threat to tree snail populations, then active measures would be taken to protect the tree snails. However, such actions do not appear to be warranted at this time.

Vehicular access for geophysical activities would be prohibited in snail habitats. Drilling and production activities would be prohibited in hammocks under the proposed action, so no direct impacts should occur.

Conclusion. The proposed action would afford continued protection of *Liguus* tree snail populations and their habitat.

Cumulative Impacts on *Liguus* Tree Snails. Some varieties of *Liguus fasciatus* on privately owned land in the Florida Keys and in other areas of south Florida would continue to be threatened by habitat destruction because of expanded development and agriculture in hardwood hammock vegetation. Some color forms could be lost. Big Cypress and other protected public lands could, then, become increasingly important as refuges for remaining populations.

IMPACTS ON WHITE-TAILED DEER AND FERAL HOGS

Analysis. Generally, white-tailed deer habitat would be improved under the proposed action as a result of expanding the prescribed burning program. This would likely increase browse availability, palatability, and nutrient content, thus benefiting deer over much of the preserve (FGFWFC, Harlow and Jones 1965). Burning in patches at varying seasons would maintain adequate cover for deer in addition to improving browse. In general the prescribed burning program would contribute to improved health of the herd and recruitment success. Deer mortalities from fire are uncommon, and although a few individuals could perish as a result of increased burning, the potential negative effects are expected to be insignificant, particularly with respect to the positive gain to the population from habitat improvement (Forest Service, Wade et al. 1980a).

Proposed measures to control exotic species could result in somewhat improved deer habitat by reducing the amount of acreage occupied by melaleuca. The actual usage of melaleuca stands by deer is unknown. Deer are occasionally seen in these stands, but most researchers agree that melaleuca invasion decreases deer habitat quality compared to most native vegetation types (Duever et al. 1986a). Melaleuca tends to be concentrated in former prairies and cypress prairies, which are poor deer habitat, so the gain in deer habitat as a result of melaleuca control would probably be limited. The primary benefit would be preventing the expansion of melaleuca into other, more productive habitats.

Proposed hydrological management actions, particularly the Turner River and Loop Road restoration projects, could lead to localized adjustments in the distribution of vegetation, but this is not expected to have a large effect on the white-tailed deer population.

Cattle in the Bear Island unit have apparently transmitted bluetongue virus, epizootic hemorrhagic disease, and other diseases to deer, and these diseases could be suppressing the deer population in the unit (Forrester and Roelke 1985b). The effects of diseases transmitted to deer may be somewhat reduced because of continued long-term reductions in the numbers of cattle and stricter biomedical standards for cattle, but such diseases could remain in the deer herd at subclinical levels so long as cattle were present. If the deer population rapidly increased beyond the carrying capacity of the unit, increased deer densities could result in an outbreak of disease and a drastic reduction in the herd in Bear Island. Proposed actions to increase the deer population through a reduction in hunting and improved habitat could pose an increased risk of population collapse from disease if densities became too high. This risk would be mitigated by carefully monitoring the deer population and habitat conditions and adjusting hunting management if conditions warranted.

Proposed NPS frontcountry development actions would not be likely to influence deer habitat significantly because a total of only 6 additional acres would be disturbed, with all of the disturbance in small parcels adjacent to existing developments.

Projected oil and gas development could occupy an additional 203 acres. Vegetation types identified as important resources would be protected, and petroleum development would be limited to second-growth pinelands and prairies, the least productive deer habitat. Deer densities in pinelands and prairies are on the order of one deer per several hundred acres, so it is doubtful that habitat loss due to projected petroleum development would significantly affect the deer population. Deer could be more affected by oil roads and pipelines that could subdivide established home ranges as well as engine noise and lights associated with well drilling. It has been estimated that a drilling rig operating in the preserve is audible over a radius of at least 3 miles. However, white-tailed deer easily habituate to nonthreatening human presence (Behrend and Lubeck 1968); consequently, the disturbance effects on deer would probably be short term (see general discussion of disturbance effects on wildlife under "Impacts on Florida Panthers"). A minor temporary loss of habitat would be associated with geophysical activity. Most of the damaged habitat should quickly recover, with minimal impact on wildlife. Human presence, along with blasting associated with geophysical work, would temporarily displace some deer. This displacement should be localized, and most of the dispersed animals would probably return within a short time. Observations by NPS personnel during geophysical operations (1988) have shown severe fright responses to low-altitude helicopter overflights. The long-range impact of occasional overflights is suspected to be minimal.

Direct impacts on deer habitat from ORV management would also not be great. Even in marshland where about 120 acres of former ORV trails would be revegetated, the added habitat would at best support an equivalent of only two deer. Possibly more important than vegetation effects would be the potential reduction in disturbance to deer from ORV noise and the presence of hunters in the Bear Island, Deep Lake, and Corn Dance units. Studies in the southeastern United States have documented increased deer movement during the hunting season, when it is not uncommon for deer to temporarily abandon their normal home ranges to apparently avoid hunters (Downing et al. 1969). There have been no specific studies of ORV effects on deer in the Southeast; studies of white-tailed deer in relation to snowmobile use in the northern United States showed little or mixed responses, but snowmobiles in the areas studied were not used for hunting (Dorrance et al. 1975; Eckstein et al. 1979; Richens and Lavigne 1978). The intent of the proposed action would be to reduce possible ORV-related stresses on deer to improve their health, condition, and reproductive success.

Proposed changes in hunting regulations would be likely to decrease deer mortalities. The proportion of the deer population eliminated by hunting each year in the preserve is unknown, but Harlow and Jones (FGFWFC 1965) estimated that legal and illegal harvests, plus crippling losses, average 18 percent of the total population annually, accounting for 56 percent of the annual deer deaths from all causes. Based on this estimate, proposed hunting restrictions could reduce the annual hunting-related mortalities preservewide by 5 to 9 percent of the total population. Deer harvests would probably be highest in the Turner River unit because of the continued use of dogs. Preservewide, the decrease in mortality would increase the proportion of older bucks in the population.

Eliminating dogs for deer and hog hunting in the Deep Lake, Corn Dance, and Stairsteps units could also contribute to increased deer populations. There is some disagreement among wildlife biologists about the effects of hunting dogs on deer. Marchinton et al. (1971) studied the effects of hunting dogs in several southeastern states, including sites in northern and central Florida, and concluded that in dense coastal plain swamps, similar to Big Cypress, dogs do not significantly increase deer harvests or adversely affect deer behavior or reproduction.

However, two studies by the Florida Game and Fresh Water Fish Commission concluded that hunting dogs do significantly affect deer populations. In a statewide survey of wildlife management areas, relative deer densities were found to be much lower in areas where dogs were used than in areas where they were prohibited (FGFWFC 1982). A second game commission study (1985a) compared areas open to dog hunting and still hunting and an adjoining deer refuge in Ocala National Forest in central Florida. Densities were highest in the refuge (1 deer/11 acres), moderate in the still-hunt area (1 deer/55 acres), and lowest in areas open to hunting dogs (1 deer/90 acres). Despite considerably lower deer densities in the area where hunting dogs were allowed, reproduction potential (both in terms of proportion of pregnant does and numbers of does carrying twin fawns) was higher in the still-hunt area than in the dog-hunt location. These results indicate that while hunting pressure in the still-hunt area contributed to a fivefold reduction in deer density compared to refuge conditions, the added stress of hunting dogs reduced densities more than eightfold, and apparently interfered with deer reproductive capability.

Other studies of deer behavior in relation to hunting dogs have shown that deer may be run several miles from their home range by dogs, requiring anywhere from a few hours to several days for them to return to their original territory (Downing et al. 1969). It is therefore reasonable to assume that eliminating the use of dogs in the Deep Lake, Corn Dance, and Stairsteps units and retaining the ban on dogs in the Bear Island and Loop units would contribute to increased deer densities by reducing out-migration and increasing recruitment. Use of dogs in the Turner River unit would be reduced under the full-season quota and shortened general gun season, probably resulting in less deer movement than under current conditions.

Overall, deer densities would be expected to increase due to reduced hunting harvests, improved habitat, and possibly reduced harassment from hunting dogs and ORVs. The largest increases would be expected in the Bear Island, Deep Lake, Corn Dance, and Stairsteps units. As the deer population increased, the rate of reproduction would decrease in response to increased densities. The population would likely shift toward older deer. The hunter quota would be adjusted annually to apply a check on the deer population to keep densities relatively high but without producing excessive numbers of deer, which could reduce habitat quality.

Effects of the proposed action on feral hog habitat would be similar to those expected for deer. Expanding the prescribed fire management program would improve forage for hogs more than any other proposed action. Hogs frequent pinelands and marshes, which would be maintained by fire. Improving forage would generally result in better health and recruitment of the hog population. Greater control of melaleuca would probably improve hog habitat in treated areas, possibly affecting several hundred acres. Proposed hydrological restoration projects at the Turner River canal and the Loop Road could locally affect habitat, movements, and distribution, but these effects would probably not result in a significant change in the preservewide population.

Expanding frontcountry developed areas by a total of 6 acres would probably not reduce hog habitat. The expected expansion of oil and gas development by an estimated 203 acres, primarily in second-growth pinelands and prairies, would be of somewhat more significance to hogs than to deer because feral hogs apparently use prairies and pinelands more than deer (NPS, Barron 1978). This loss of habitat would have localized effects, but would not be of much influence on the preservewide hog population.

Hogs may be more affected by human activity, noise, smells, and lights associated with petroleum development. Feral hogs appear to be less tolerant of human presence than deer. Hogs tend to be less frequently seen and have a longer running distance if disturbed. Even though hogs habituate to some extent to nonthreatening human presence, they often appear to be more wary than deer when near people or structures. Petroleum developments in currently undeveloped areas would conceivably alter feral hog home ranges and movements in the surrounding area for some time and could tend to lower hog densities around oil pads, where human activity is highest.

Revegetation of some ORV trails would probably have only a minor influence on feral hog habitat. As with deer, the reduction in areas affected by ORV noise and human activity could be more important, particularly in the Bear Island, Deep Lake, and Corn Dance units where ORV activity would be restricted to designated tails. Eliminating the use of hunting dogs in these units would probably also reduce stress on the hog population. Consequently, there would probably be less human-induced movement of hogs. Whether or not this change would significantly affect feral hog health, reproduction, or mortality is unknown, but it could potentially be significant. Recent studies by the Florida Game and Fresh Water Fish Commission, for instance, found reduced adrenal gland weights in hogs during the fall and winter, and this was interpreted as a physiological response to increased seasonal environmental stress (Belden et al. 1985).

Proposed hunting management changes would benefit the hog population. The Florida Game and Fresh Water Fish Commission cites heavy hunting pressure as the major problem in maintaining hog populations in the state (Belden and Frankenberger 1984), so that the proposed reduction in hunting pressure would be likely to sustain and to some extent expand the population in the preserve. As described in the "Affected Environment," hogs are capable of fairly rapid reproduction; however, environmental factors, especially food availability and seasonal water levels, largely constrain the population. Hunting harvests appear to exert considerable influence beyond these factors, removing as much as 19 percent of the population annually (Belden et al. 1985). Variation in habitat quality in the preserve means that the effects of reduced hunting pressure would also vary. In poorer habitats, such as those in portions of the Corn Dance unit, expansion of the hog population may not be great; whereas in better quality habitat, such as Bear Island, population increases could be sizable.

The proposed action calls for using trapping, recreational hunting, and other methods to locally control hog populations and movements to prevent resource damage and overpopulation. Risks associated with rapid expansion of hog populations are damage to archeological resources or native biota by rooting, competition with the native white-tailed deer for mast or other limited food, or an outbreak of brucellosis, pseudo-rabies, or other diseases. The proposed action would attempt to avoid these adverse effects through careful monitoring and adjustments in the management program. In-migration of hogs from lands outside the preserve, as well as illegal releases of hogs within the preserve, would continue to affect management strategies.

Conclusion. White-tailed deer and perhaps feral hog populations would be expected to moderately increase as a result of the proposed action.

Cumulative Impacts on White-tailed Deer and Feral Hogs. The trend in south Florida toward both more urbanization and expanded agriculture in upland areas, and oil and gas development throughout the region, may accelerate a regionwide decrease in deer and hog habitat. In addition to direct habitat removal, remaining habitat in some locations would be fragmented, causing constricted home ranges and possible genetic isolation.

As residential and commercial development grows along the Gulf Coast and the I-75 corridor outside the preserve, large tracts of second-growth pinelands and disturbed lands would continue to be removed from deer and hog habitat. There are strong federal, state, and local regulations protecting wetlands, and these areas would become pockets of habitat, probably sustaining small isolated groups of deer. Feral hogs are less able to thrive in wetland habitat and cope with human occupation, and hog populations would probably be eliminated adjacent to much of the developed lands.

The trend of converting improved pastures and cropland to citrus groves would greatly reduce hog habitat and would have mixed effects on deer habitat. Over the next decade several hundred thousand acres are likely to be affected north of the preserve. Because of mowing and intensive use of pesticides in citrus groves, grubs and ground plants eaten by feral hogs are eliminated, destroying hog feeding habitat. For deer, converting improved pastures or row crops to citrus groves represents an improvement in habitat conditions because groves provide limited cover and some browse. However, some citrus growers fence groves to exclude deer, and others shoot deer to prevent losses of fruit due to foraging. If sizable tracts of native rangelands are converted to citrus groves, deer habitat could be degraded on a large scale.

The increasing human population of south Florida would continue to increase the market demand for hunting, ORV use, and other outdoor recreation in the region, placing further stresses on deer and hog populations. Combined with long-term reductions in available habitat regionwide, increased demand would force more restrictions on access and use of public lands, as well as more intensive habitat management for deer, hogs, and other wildlife species. This trend is already evident in areas such as the Fakahatchee Strand State Preserve, which was closed to hunting in 1987, and in the statewide restrictions on the use of ATVs for hunting initiated in 1985.

In response to anticipated habitat reductions, especially as related to the endangered Florida panther (see "Cumulative Impacts on the Florida Panther"), efforts are underway at the federal, state, and local levels to acquire almost 200,000 acres of private lands for wildlife management purposes. These lands would be contiguous with Big Cypress National Preserve and would benefit deer and hog populations as well as panthers.

In summary, the amount and quality of habitat available to white-tailed deer and feral hogs in south Florida is expected to decrease over the long term, probably by several hundred thousand acres. Deer populations may be moderately to heavily reduced north of Florida 84; feral hog populations would be more affected than deer and could be eliminated in many portions of the region. As agriculture and urbanization grow and natural habitats become occupied or fragmented by human land use, large contiguous tracts of native vegetation, such as provided by Big Cypress National Preserve and other public lands, would become increasingly important for the maintenance of wildlife resources.

IMPACTS ON AIR QUALITY

Analysis. It has not been determined how existing or future oil and gas activities are now, or will in the future, affect air quality in Big Cypress. In a generic sense, geophysical activities would affect air quality primarily because of vehicle use. Smoke from internal combustion engines, as well as sulfur dioxide, nitrogen dioxide, carbon monoxide, and hydrocarbons, would cause air quality impacts. Some fugitive dust may be present during shot-hole drilling and vehicular activities from work during the dry season. These impacts would be temporary, however, since geophysical activities are relatively short-lived (weeks or months).

Exploratory drilling would create impacts on air quality because of diesel fuel emissions, fugitive dust, vehicular internal combustion engines, and petroleum-related odors for the duration of the drilling. Fugitive dust could be controlled by watering roads, closing and reclaiming disturbed areas as soon as possible after construction, and placing speed limits on roads. The use and maintenance of all applicable pollution control devices on internal combustion engines and fuel storage tanks would minimize impacts from hydrocarbons, sulfur dioxide, nitrogen dioxide, and carbon monoxide. Because an exploratory drilling operation lasts for only one or two months, impacts would be short term.

Impacts on air quality associated with oil field development would occur from fugitive dust created by earth moving, clearing, and vehicle travel; gaseous emissions from support vehicles; emissions from well fluids; and by-products from propane-fired "heater-treaters." Additional impacts could occur from thick, black smoke due to well fires and hydrogen sulfide emissions. Blowout preventers and hydrogen sulfide contingency procedures would be used to mitigate these impacts. Light end (natural gas) and volatile hydrocarbon emissions resulting from well fluids returned to the surface could be controlled by the use of wet-gas gathering systems and flares. Since wells in Big Cypress may produce for 60 years or more, these impacts could have long-term effects on the air quality of the preserve.

Air pollution injures plants by affecting growth, reproduction, and survivorship. Animals may be injured indirectly by air pollutants by ingesting plants contaminated with pollutants. However, there are instances where animal species (often birds, fish, and insects) are injured directly without a plant species having a major role in their toxicity. An example of this is owls dying from hydrogen sulfide at a production pad facility in North Dakota (NPS Air Quality Division, memorandum 1987).

There were 23 producing wells in the Raccoon Point and Bear Island fields in 1988. The Raccoon Point field is a major source of air pollution. The Florida Department of Environmental Regulation estimates this field produces 350 tons per year of nitrogen oxide emissions, among other pollutants. Although no monitoring has been conducted, the National Park Service suspects that the Bear Island field probably is emitting pollutants at the same general level as Raccoon Point.

The prescribed burning program would result in temporary decreases in air quality. However, the decreases would be within levels allowed under state-prescribed burning permits, which are issued for each management fire.

Conclusion. Increased oil and gas activity, which could occur on up to 10 percent of the preserve at any one time, would likely increase negative impacts to air quality, but the level of impact is unknown. Adequate mitigation measures may help to offset much of this potential impact. Air quality impacts from prescribed burning would continue to be limited to levels permitted by the state.

Cumulative Impacts on Air Quality. Big Cypress is a class II clean air area. Everglades National Park, which is directly to the south and is also a United Nations' biosphere reserve and a world heritage site, is a class I area. Emissions from oil-fired power plants, sugar cane processors, and a portland cement plan in the region, if these sources were constructed or expanded after the monitoring baseline was established, may have consumed some of the class I and class II increments for the prevention of significant deterioration. Therefore, even though some individual site impacts may be minor, collectively they may be significant, and they may have exceeded allowable levels.

IMPACTS ON CULTURAL RESOURCES

Analysis. Cultural resource sites would receive more protection in the Loop, Corn Dance, Bear Island, and Deep Lake units because ORV trails would be designated or closed. ORV trails would avoid cultural sites, reducing the level of contact by ORV users. Dispersed ORV use in the Turner River and Stairsteps units would allow selective closures of small areas and limited portions of trails to give some added level of protection to cultural sites. (Owners of improved properties on which cultural resources are located would still be allowed access to their properties as long as no detrimental actions occurred to the cultural sites.)

The expansion of the prescribed burn program would reduce the level of hazardous fuels, reducing the chance of hot fires that might damage cultural resource sites. The expansion of the exotic plant and animal control program would reduce the damage caused by roots and burrowing animals.

The level of all protection efforts would depend on available funding and would be distributed to actively manage those sites that are on or eligible for inclusion on the National Register of Historic Places, as determined by the Southeast Archeological Center in consultation with the Florida state historic preservation officer.

Designated backcountry campsites under the proposed action would provide increased protection for cultural sites in the Corn Dance, Deep Lake, Bear Island, and Stairsteps units. Cultural sites would be avoided where possible as part of the site selection process.

Certain oil and gas geophysical activity could be allowed in hardwood hammocks, which contain the majority of archeological sites, under very stringent stipulations of the minerals management plan. Drilling and production operations would have no additional effect on archeological sites because all sites would be fully protected under the proposed action. Miccosukee and Seminole Indian cultural sites would not be affected because drilling and production operations would be prohibited in such areas. Some geophysical activity could be permitted near these sites only under very stringent stipulations as found in the minerals management plan and only after consultation with tribal representatives and the state historic preservation officer.

Conclusion. Cultural resource sites in units where backcountry camps and ORV trails are designated would receive increased protection as compared to current conditions. Sites on or eligible for inclusion on the National Register of Historic Places would receive increased protection. Resource sites would be fully protected from all oil and gas activities.

Cumulative Impacts on Cultural Resources. The archeological resources in Big Cypress National Preserve would become increasingly important as such resources outside the preserve are lost to development and to expanded agricultural use of native range and forested uplands.

As Florida's population grows, development would increasingly occur on agricultural lands and lands once considered marginal for development. Because there are no requirements for developers on private property to survey their lands for archeological resources before construction (except for activities governed by federal and state environmental protection laws), and because no provisions exist for notifying professional archeologists of such finds or funding for mitigation, federal and state lands would increasingly become the places where such resources would be preserved.

Even though finer scientific examples of Indian occupation sites may exist outside Big Cypress, without protection such sites could be lost, thus increasing the educational and scientific importance of those remaining in Big Cypress. Additional pressure would be brought on federal agencies to protect archeological resources from collectors of Indian artifacts who will find it more and more difficult, as sites are depleted, to continue treasure hunting and other forms of looting. Protection would require continual monitoring of known sites, a program to educate visitors about the importance of archeological resources, and strict enforcement of the Archeological Resources Protection Act and chapter 872 of the Florida Statutes (1987), when human remains are involved.

IMPACTS ON HUNTERS AND HUNTING

Analysis. The proposed action to restrict ORV access to designated trails in the Bear Island and Corn Dance units, along with eliminating ORVs in the Deep Lake unit, would considerably limit the mobility of hunters in areas of the preserve that have traditionally been open to ORV users. The Loop unit, which has been closed to ORVs for 10 years, would remain closed under the proposed action. The amount of terrain that could be covered by hunters on ORVs would be substantially reduced. It is estimated that the proposed action would eliminate ORV use and therefore reduce hunting opportunities along approximately 245 miles of existing trails. The most likely effects of restricting ORV use to designated trails in the Bear Island and Corn Dance units would be to increase walk-in hunting and to intensify hunting within 1 to 2 miles of designated ORV trails. Approximately 75 percent of the hunters surveyed by the game commission already combine walk-in hunting with ORV use (FGFWFC 1986).

Restricting ORV use to designated trails in the Bear Island and Corn Dance units could also improve the hunters' success rates for taking deer. The game commission survey of successful hunters in the Bear Island, Monument, and Stairsteps units found that 88 percent of the hunters for the 1983-84 season and 68 percent for the 1984-85 season shot their deer while walking rather than from an ORV (FGFWFC 1986). However, with ORV access restricted to designated trails, which deer could learn to avoid, hunters may have to walk farther to find game.

Changing the status of two preserve units (Stairsteps and Turner River) from unrestricted ORV use to a dispersed use system would have little or no effect on hunters. A few hunters might be inconvenienced if access to their favorite hunting spot was closed to correct a resource problem (for example, to allow a cypress stand to recover). A hunter who enjoyed hunting near one of the closed trails might have to walk to a particular hunting spot instead of using an ORV.

In units open to ORV access the number and location of designated entry points would be adequate to provide access to hunting areas for the majority of hunters. A few hunters whose traditional entry points were closed might feel inconvenienced. Upgrading some of the major entry points by providing improved parking and safer access from adjacent roadways would enhance the overall experience for most hunters.

The proposed action to eliminate all ORVs except airboats east of Gator Hook Strand in the Stairsteps unit would affect approximately 57 percent of the ORV users in the Stairsteps unit. Because of the high cost of constructing an airboat, a majority of hunters who are non-airboat users would likely shift to the area west of Gator Hook Strand in the Stairsteps unit or to other units of the preserve where ORVs are allowed. Prohibiting the use of track vehicles would affect approximately 4 percent of the hunters in the Stairsteps unit.

Approximately 58 percent of the hunters surveyed during the 1985-86 hunting season reported using dogs in the preserve (FGFWFC 1986), and information from check stations and field checks indicate that approximately 50 percent of the hunters were using dogs. The Florida Game and Fresh Water Fish Commission concluded that using dogs apparently increases the success rate for hunters (1986). Under the proposed action using dogs for deer hunting would be prohibited in the Deep Lake, Corn Dance, and Stairsteps units, in addition to the Loop and Bear Island units, which are currently closed to such use. For many of these hunters, the quality of hunting and the traditional hunting experience with dogs would be reduced. Because the use of dogs would be prohibited in these additional units, the number of hunters wanting to use dogs in the Turner River unit could increase dramatically. However, possible adverse effects associated with an increase in this type of hunting would be mitigated by setting limits on the numbers of hunters (full-season quota) and by reducing the numbers of deer and hogs that could be harvested (proposed 25 to 50 percent reduction). Also, hunters using dogs would have to compete for permits with hunters who do not use dogs. Therefore, the overall effect might generate an increase in the number of hunters using dogs in the Turner River unit.

Even though restricting dogs from selected areas of the preserve could mean that more white-tailed deer and feral hogs would be potentially available, some hunters could perceive that there were fewer deer and hogs because dogs would not be pushing these animals into the open. Therefore, eliminating dogs in all units except Turner River could to some extent decrease the number of deer taken.

Under the proposed action the use of dogs would also be prohibited for raccoon hunting in the Deep Lake, Corn Dance, and Stairsteps units, in addition to the Bear Island and Loop units (which are currently closed to this use). Hunting raccoons with dogs would still be legal in the Turner River unit. Because there are probably fewer than 50 raccoon hunters in the preserve, any increase in hunting pressure due to raccoon hunting in the Turner River unit would be minimal.

The present limited quota permits apply to only the first nine days of the 60-day general gun season. Following the first nine days, anyone with a Florida hunting license (purchased over the counter) can hunt in the preserve (general gun) for the remaining 51 days in the season. The proposed action to establish a full-season quota and to reduce the length of the general gun season to 40 days would reduce all general gun hunting to a 40-day period and restrict hunting during that 40-day period to only those licensed hunters who had a wildlife management area stamp and a limited quota permit.

The proposed full-season general gun quota could change hunting patterns in the preserve. Those hunters who were not successful in obtaining a quota permit during the general gun season for that year would have their opportunities to hunt limited to bow and muzzle-loaded gun. As a result, the number of hunters during the bow and muzzle-loaded gun seasons could increase. Many hunters could also choose to hunt somewhere other than the preserve during the general gun season. For the short term (one to three years) the full-season hunter quota could be the primary tool to reduce the deer and hog harvest by 25 to 50 percent. To accomplish this reduction, the hunter quota for the general gun season might have to be reduced. In order to assess the impacts of this action, a 40 to 60 percent reduction compared to the 1985-86 season was assumed. This would entail a reduction of the preservewide general gun quota from 2,500 (1985-86) to 1,000-1,500 quota permits under the proposed action. The actual full-season hunter quota would be developed by the National Park Service and the Florida Game and Fresh Water Fish Commission and would most likely fluctuate from year to year in response to game populations.

For those hunters who obtained permits, the experience would probably be reminiscent of a "wilderness" type hunting trip. Hunters who enjoy the social experience of meeting and hunting with others might not like this type of experience. Over the long term (four to eight years), it might be possible that the full-season quota, the reduction in the number of deer and hogs harvested, and the shorter hunting season could cumulatively result in increased deer and hog populations. If these populations were shown to be high enough both to sustain the Florida panther population and to provide a surplus, then more hunters could be allowed to hunt, and under ideal circumstances hunting permits could be issued to all those who applied.

Making hunter quota permits nontransferable during the entire 40-day general gun season would reduce the total number of hunters. Because 2,500 permits are currently issued only for the first nine days of the season and can be transferred to other hunters, the permits can potentially be used by a much larger number of hunters. The proposed nontransferable quota system would establish a more equitable selection system for hunters based on a random draw and would eliminate the informal transfer of permits. It would also allow for more accurate data collection because the exact number of hunters would be known.

Expanding the current prescribed fire and exotic plant control programs would improve habitat for more game species, including deer and hogs. Prescribed fires could interfere with some hunter activity and could pose some minor threat to hunter safety.

A few hunters could be inconvenienced by prohibiting hunting in five buffer areas around proposed interpretive boardwalks and trails.

Providing 50 backcountry shelters would provide both the general public and hunters with a continuing opportunity to camp and use the preserve's backcountry. The shelters would also help disperse hunting.

To gather more accurate data for the panther prey study, hunters would be contacted and monitored in the field more frequently. Some hunters could view this as an intrusion; others could view these actions as a means of improving the long-term quality of hunting. Illegal hunting activities would be expected to be at a minimum during this monitoring effort.

Geophysical activities would be permitted throughout the preserve, in accordance with stipulations contained in the minerals management plan. Careful scheduling of operations would help to eliminate conflicts with hunters during hunting seasons.

In the Bear Island unit abandoned oil and gas pads are currently used as campsites by hunters. These would no longer be available if reoccupied by oil and gas operations. In other units, which would be open to limited oil and gas development, some ORV trails used by hunters could be displaced by oil and gas access roads. This would inconvenience some hunters, even though replacement corridors would be designated for ORV use. Hunting opportunities would be lost in buffer areas around access roads and pads, which would be designated as safety zones. Increased oil and gas development would also create visual and noise intrusions in the natural setting, which could affect the experience of many hunters.

Conclusion. Hunting would continue in the preserve; however, hunting activity as related to white-tailed deer and feral hogs would be reduced over the short term by 25 to 50 percent, compared to existing conditions.

Cumulative Impacts on Hunters and Hunting. Florida has 57 type I wildlife management areas, comprising approximately 4.4 million acres of land. Even though various restrictions apply, all type I areas provide a range of public hunting opportunities and account for 271,225 hunter-days (1985-86) of general gun activity (FGFWFC 1986). Another 1 million acres of type II wildlife management areas provide additional hunting opportunities for those hunters willing to purchase or obtain permits from private landowners.

Big Cypress National Preserve is designated by the state as a type I wildlife management area and is one of seven type I areas in south Florida (the others are Everglades, Holey Land, J. W. Corbett, Rotenberger, Brown's Farm, and Cecil M. Webb). These seven type I areas (1,475,895 acres) comprise approximately 34 percent of the total acreage represented by type I areas in the state. The Big Cypress wildlife management area (564,320 acres) comprises approximately 13 percent of the acreage for all type I areas in the state and 38 percent of the acreage represented by all type I areas in south Florida.

Use of the seven type I areas (including Big Cypress) in south Florida accounts for 31,604 hunter-days (1985-86 season) of general gun activity, representing 12 percent of the total general gun activity statewide (FGFWFC 1986). Use of Big Cypress accounted for 13,865 hunter-days in the 1985-86 general gun season, representing 44 percent of the general gun activity in south Florida and 5 percent of the total general gun activity statewide.

The 1985-86 season totals for Florida's wildlife management area regions (northeast, northwest, central, south, and Everglades regions, as defined by the Florida Game and Fresh Water Fish Commission) show that, compared to the previous season (1984-85), the deer harvest was down by 9 percent, the hog harvest by 25 percent, and hunter-days by 15 percent. The decreases were partly due to increased regulation. However, the state's Everglades region, which includes Big Cypress, was the only region showing a substantial increase (by 20 percent) in the deer harvest. Hunter-days of pressure decreased over the past year (1984-85) in all regions except the northeast. Hunter-days of activity in the Everglades region was down by 2 percent as compared with the central region (20 percent decrease) and the south region (50 percent decrease as a result of removing Fisheating Creek as a wildlife management area).

Statewide hunting activity and harvest seem to be on a downward trend due to more restrictive regulations and the loss of wildlife management areas. The Everglades region has had a slower rate of decrease in hunting activity as compared to other Florida regions, but the proposed action to further restrict hunting in Big Cypress would accelerate the rate of decrease locally. On a statewide level the decrease should have little effect because the preserve accounts for only 5 percent of total general gun hunting in Florida.

The population in south Florida is expected to increase, and a recent survey projects a 17 percent increase in the market demand for hunting by the year 2000 (see "Affected Environment"). It is also expected that all land management agencies will continue to move toward increased regulation in order to protect diminishing natural resources. Consequently, the long-term trend in south Florida will be fewer hunting opportunities and more restrictions on hunting.

IMPACTS ON ORV USERS

Analysis. As previously stated, hunting and ORV use are almost inseparable because a majority of the hunters in Big Cypress use ORVs. Impacts on those ORV users who are also hunters are discussed under "Impacts on Hunters and Hunting." The following discussion relates to recreational ORV use not related to hunting.

Under the proposed action ORV use would be prohibited in the Deep Lake unit, in addition to the Loop unit (which is currently closed to this use). The proposed action would restrict ORV use in the Bear Island and Corn Dance units to designated trails, which would curtail the freedom of movement for some ORV users. Dispersed use would be allowed in the Turner River and Stairsteps units, and most recreational users would not notice any major change after the dispersed use proposal was implemented. A few users might be inconvenienced under the dispersed use system wherever particular trail segments or areas were closed to ORV use in order to protect resources. There would be an overall reduction in ORV trail mileage of about 20 percent.

Improved parking and access at 13 designated access points, as well as new concession-operated ORV storage facilities, would benefit all ORV users by providing more convenient facilities and by making access points safer. ORV users would be able to enter the preserve only at 37 designated access points. Many ORV users would feel inconvenienced because they could previously enter the preserve anywhere along roads or the boundary.

Numerous ORV trails and roads crisscross the preserve, and for those recreational ORV users not familiar with the trails, the choice of routes may be confusing. The proposed action to designate trails in two units and to provide campsites in four units would make it easier for ORV users unfamiliar with the preserve to explore larger areas. This potential for increased use in the backcountry could cause some conflict with more experienced ORV users who may be accustomed to seeing few others in the backcountry.

The proposed action to issue only 2,500 ORV permits per year in the preserve would place a ceiling on this type of use, regardless of future regional population increases or changes in regional recreation patterns. (Based on market surveys, recreational ORV use is projected to increase by 14 percent by the year 2000.) If the number of requests for ORV permits exceeded the quota, permits could be issued randomly through a lottery or draw. Under such a system, recreational ORV users would not necessarily be guaranteed a permit on a yearly basis. With this ceiling on ORVs, potential conflicts between ORV users and other recreational users (for example, hikers) would be limited.

The proposed action to increase the level of prescribed burning would increase the potential for safety problems for ORV users; however, safety is a prime consideration in the fire program, and no injuries have occurred to date.

The proposed action would prohibit the use of tracked ORVs within the preserve in order to prevent resource degradation. Approximately 50 owners of tracked ORVs would have to find alternative equipment for use in the preserve or find alternative locations outside the preserve to use their vehicles.

After completing geophysical activities, oil and gas interests would be required to implement reclamation measures to mitigate any adverse effects from related vehicle use, as described in the minerals management plan (see appendix C). Failure to reclaim these geophysical lines could result in modified use of the seismic lines as ORV trails. In this case not only would direct impacts to the resource continue, but access would be provided to areas that had previously been difficult or impossible to reach. In the Bear Island unit increased oil and gas drilling and production activity on existing roads could conflict with ORV use. In the Turner River, Corn Dance, and Stairsteps units some ORV trails could be displaced by oil and gas access roads. Access roads and megapads could create detours for ORV travel because these vehicles would probably be allowed to cross access roads only at specified locations.

Conclusion. Total ORV use would decrease primarily due to reduced hunting-related ORV use, while nonhunting, recreational ORV use would be likely to increase. There would be a 20 percent reduction in mileage of ORV trails available.

Cumulative Impacts on ORV Users. The seven type I wildlife management areas in south Florida (including Big Cypress) provide approximately 1,413,600 acres total of lands open to some type of ORV use, even though each of the areas prohibits certain types of vehicles in specific areas and each has a variety of restrictions of ORV use. As of 1987, Big Cypress National Preserve provides approximately 500,000 acres of public access for some type of ORV use, representing 36 percent of the total acreage available for ORV use in south Florida. The proposed closure of the Deep Lake unit (32,000 acres) to ORVs should not have a significant effect on recreational ORV use in south Florida.

Overall sales of ATVs and off-road motorcycles in Florida have increased by 39 percent from 1982 to 1986; however, sales declined by 21 percent between 1984 and 1986, partly because of the publicized safety problems associated with these vehicles (personal communication, Specialty Vehicle Institute of America 1987). Hunting regulations, the additional restrictions on ORV use, the closure of the Deep Lake unit to ORVs (in addition to the Loop unit, which is currently closed), the eventual removal of trespass properties within the preserve, and the trend in declining sales of ORVs could all contribute to a gradual decline in ORV use in the preserve. Although an overall decrease in ORV use in the preserve might be expected in the future, the proposed action could increase the proportion of recreational ORV use in the preserve compared to hunting-related ORV use because of the designated trail system and the reduction in the length of the hunting season.

IMPACTS ON OTHER VISITORS

Analysis. In addition to hunters and ORV users, other visitors include hikers, fishermen, tourists, wildlife observers, and retirees who travel during the winter.

The designated ORV trail system in the Corn Dance unit would allow users to cross the Florida National Scenic Trail only at specified locations. This action could significantly reduce the number of conflicts between ORV users and hikers and improve the experience for hikers along portions of the trail between specified ORV crossings.

Tourists, wildlife observers, and hikers would expect to see fewer ORV users near the East Hinson Marsh interpretive area. Designating ORV trails in the Bear Island unit would eliminate unrestricted use and would reduce the visual and noise impacts of ORVs in and directly adjacent to East Hinson Marsh.

Shortening the general gun hunting season from 60 days to 40 days would increase opportunities for nonhunting visitors. Tourists, hikers, and other nonhunting visitors would have an additional month during Florida's prime tourist season to use the preserve without concern for personal safety.

The proposed interpretive program would acquaint all users with the preserve, heighten their awareness, and probably provide a more enjoyable experience. Upgrading camping areas within the preserve could result in campers and fishermen wanting to stay longer.

More prescribed burns could occasionally conflict with the activities of hikers and other recreational users. Smoke along roads and across the preserve would negatively affect some users.

Geophysical activities would be permitted throughout Big Cypress, in accordance with the stipulations of the minerals management plan. Careful scheduling of operations would eliminate conflicts with visitors. Although geophysical activities generally last only a short time, the level of activity during the operation is very high and could be quite disruptive to visitors.

Drilling and production activities within the preserve would intrude on the natural setting, potentially for 60 years or more. However, these operations would generally not be near popular visitor use areas, so effects on visitors other than hunters and ORV users would be minimal.

Conclusion. The general public would have more opportunities to pursue recreational activities and a longer period to enjoy the preserve. Compared to existing conditions, there would be fewer conflicts between hunters/ORV users and other visitors.

Cumulative Impacts on Other Visitors. Table 1 shows the recreational needs listed for region IX, which includes Collier County and the bulk of the preserve. As previously stated, there are no resources in the preserve to meet the number one expressed need for saltwater beaches. Bicycling, which ranked ninth in need, can be accommodated along the 25-mile Loop Road; however, the Loop Road would probably be considered by most bicycle enthusiasts as a secondary resource because no special design considerations for bicycles would be proposed. Although horseback riding ranked low in need (71 out of 92 activities), large areas of the preserve could accommodate horseback riding even though it has not been a traditional use. Overall the preserve would modestly contribute to the recreational needs as defined by *Florida's 1985 Outdoor Recreation Action Program Report* (Florida Department of Natural Resources 1985).

Everglades National Park will continue to be the primary destination park in south Florida. The proposed visitor services at Big Cypress would further contribute to visitors' understanding of the natural and cultural history of the Big Cypress swamp and south Florida in general. Implementing an interpretive program for Big Cypress would help more people become aware of the preserve's purpose.

IMPACTS ON NONFEDERAL PROPERTY OWNERS

Analysis. Nonfederal landowners (inholders) within Big Cypress National Preserve include the following:

> owners of exempt inholdings, including about 100 frontcountry inholders (properties accessible by street-legal vehicles) and 100 backcountry inholders (properties accessible by ORVs)
>
> the Dade County Port Authority, which administers the 23,481-acre Jetport
>
> Florida State School Board, which owns 12,600 acres that are managed by the National Park Service under a 1986 cooperative management agreement with the Department of Natural Resources.

Both residential and commercial frontcountry property owners would continue to have access to their properties by means of street-legal vehicles. Many of these owners now use ORVs to enter the preserve from any point along their property boundary. Some frontcountry property owners could feel inconvenienced under the proposed action because access from their properties to designated trails or areas could be limited.

Owners of exempt inholdings in the backcountry in the Bear Island (two) and Corn Dance (about 30) units, where ORV trails would be designated, would be guaranteed access to their properties by means of a designated trail. However, as with other ORV users, these backcountry property owners would be confined to the unit's designated trail system, so their ability to travel on ORVs would be restricted, compared to the existing situation.

Approximately 75 inholders in the Turner River and Stairsteps units, which would be managed for dispersed ORV use, would notice little change from the existing situation. Localized and temporary ORV trail closures for purposes of resource protection could cause a few inholders to occasionally alter their traditional access routes.

ORV activity would probably increase in the Turner River unit because recreationists would use dispersed trails and areas, not just designated trails, as they would in the Bear Island and Corn Dance units. This increase in ORV use could result in conflicts between users and the 60 inholders in the Turner River unit as a result of vandalism, noise, and litter.

ORV use on Jetport lands would be expected to increase under the proposed action because ORV use would not be restricted as it would be in the adjacent Corn Dance unit (proposed designated trails). ORV users on Jetport lands would only be able to enter the preserve by way of designated access points along the Jetport boundary. The administrators of the Jetport could have to deal with increased localized soil erosion, vegetation damage, and user conflicts at preserve access points on Jetport lands.

The overall reduction in hunting activity under the proposed action could cause some loss of income for commercial inholders. This reduction in hunting activity, in conjunction with possible lower traffic volumes on US 41 once I-75 has been completed (a state action that is not part of the NPS general management plan), could result in substantial income loss. Big Cypress is not expected to become a destination area, and commercial interests along US 41 would probably not realize any significant income gains related to increased tourism under the proposed action.

Inholders would not necessarily be able to hunt in the preserve every year. Like all hunters, inholders would have to apply for a full-season, nontransferable quota permit; without a permit they would not be able to hunt during that particular season. When combined with the proposed action to restrict the use of dogs for deer hunting, many inholders might perceive a devaluation of their land because of inconvenient hunting access. It is possible that there could be a corresponding monetary loss in property value.

Upgrading NPS campgrounds in the preserve could create some financial loss for private commercial camping operations in or near the preserve. However, the preserve campgrounds would be primitive areas (no showers, electricity, food services, or other conveniences), so full-service, private campground operation would be likely to cater to a different type of camper. Consequently, competition is not expected to be significant.

Upgrading the Loop Road and encouraging visitors to travel along this new interpretive drive would increase traffic and tourist activity, which could result in some conflicts with frontcountry property owners along the Loop Road. However, traffic is expected to be low, and inholders would benefit from improved access.

Providing two additional NPS ranger stations, one in the Bear Island unit and the other along the Loop Road near Pinecrest, would improve NPS response time for assisting visitors and for law enforcement and resource management activities.

Although the expansion of the prescribed fire management program could conceivably increase the chance for some property loss or damage, the proposed action is expected to reduce hazardous fuel levels and the chances for major fires that could cause extensive property damage, personal injury, or loss of life.

State lands within the preserve would continue to be managed according to NPS regulations and according to a 1986 cooperative agreement. The 18 sections of state land (12,235 acres) are scattered throughout the preserve. These state lands would be subject to the same impacts as other lands within the preserve.

Approximately 37 inholdings (private frontcountry and backcountry) are located on the Sunniland trend in the Bear Island, Turner River, and Corn Dance units. The trend offers the highest probability for oil and gas development in the preserve. Therefore, inholders could be affected by the construction of access roads and pads, by visual intrusions and noise, and by increased overall activity in the vicinity of their properties. Additionally, geophysical activities would be permitted throughout the preserve, in accordance with stipulations in the minerals management plan. Scheduling and locational considerations would help to eliminate conflicts with private property owners. The protection of inholders' rights to designated ORV access routes to their inholdings in the Bear Island and Corn Dance units would be addressed in reviews of proposed plans of operations for any oil and gas development.

Frontcountry inholders on Turner River Road and the Bear Island campground road in the Bear Island unit could be affected by increased oil- and gas-related traffic.

State inholdings would be subject to the same regulations (36 CFR 9B) as preserve lands with respect to nonfederal oil and gas rights.

Oil and gas developments on all lands within the authorized boundary of the preserve are subject to NPS regulations at 36 CFR 9B. However, the current regulations exempt operations in areas such as the Jetport where access across federally owned lands is not necessary. When the regulations at 36 CFR 9B are revised in accordance with PL 100-301, all lands within the authorized boundary will be subject to NPS regulations, regardless of access. The National Park Service would coordinate development and monitoring activities with the Dade County Port Authority.

Conclusion. Proposed restrictions on hunting and ORV use, as well as continued expansion of oil and gas development, could inconvenience some inholders and could reduce the personal and monetary values of some properties.

Cumulative Impacts on Nonfederal Property Owners. No cumulative impacts are expected.

IMPACTS ON MINERAL INTERESTS

Analysis. The proposed minerals management actions could have a substantial effect on mineral interests in three ways:

> ***Permitting future activity in the Bear Island unit only from existing roads and pads*** – Future drilling and production activity in this unit would be restricted to existing roads and pads. An estimated 80 percent of the oil and gas in this unit, given current technology, could be accessed from existing roads and pads, and from areas outside the preserve boundaries. Geophysical activities would be permitted in this unit, in accordance with the stipulations of the minerals management plan (see appendix C) and the proposed ORV regulations.
>
> ***Permitting surface occupancy outside of vegetation communities and cultural sites identified as important resource areas*** – Access roads, pads, and pipeline corridors would have to avoid vegetation communities and cultural sites identified as important resource areas, thus affording them a high degree of protection. Mineral resources beneath these sensitive areas could be explored and extracted by using state-of-the-art techniques such as directional drilling. Access to these mineral resources in some cases might be difficult or impossible because of the proposed restriction on occupancy of important resource areas. This would be particularly true south of US 41 in the Loop and Stairsteps units where only an estimated 55 percent of the oil and gas would be accessible. In contrast, an estimated 95 percent of oil and gas in the Deep Lake, Turner River, and Corn Dance units would be accessible. Geophysical activities would avoid important resources, if possible, but in the event that these resource areas had to be crossed, stipulations in the minerals management plan and the proposed ORV regulations would apply.
>
> ***Allowing no more than 10 percent of the surface area of the preserve to be influenced by oil and gas activities at any one time*** – The 10 percent area of influence limit could affect mineral interests whose development proposals, if implemented, would result in this limit being exceeded. Mineral owner requests for permission to develop oil and gas resources could be delayed until proper reclamation of other sites allowed for new development to occur without exceeding the limit.

Plans of operations would be reviewed on a case-by-case basis to ensure conformance with the regulations at 36 CFR 9B and with PL 93-440. In the event that access to nonfederal oil and gas rights was denied by disapproval of a plan of operations, then nonfederal subsurface interests might have to be acquired. It is difficult to predict the extent of acquisitions necessary because the National Park Service has little information regarding the oil and gas development intentions of mineral owners, lessees, and operators, and because economic conditions are changing. However, because of the proposal for the Bear Island unit and the sensitive nature of resources to mineral developments in the Loop and Stairsteps units, the National Park Service can predict that acquisition of nonfederal subsurface interests would be more likely in these units.

To determine the need for such acquisition in any portion of the preserve, mineral trends, activities, and technological advances in extraction techniques would be monitored. If private oil and gas could be extracted by means that would not create adverse impacts on the preserve, then a plan of operations could be approved and the oil and gas rights might not have to be acquired. However, if it was determined during reviews of plans of operations on a case-by-case basis that park values would be adversely affected by mineral extraction activities, then acquisition of nonfederal subsurface interests would be pursued. If acquisition was necessary, then donation or exchange would be the preferred method. It is expected that some purchases would be necessary, however, and acquisition would be possible only if funds were available. Wherever private subsurface rights were acquired by the National Park Service, except in the case of donation, the owners would be compensated at fair market value. Until it was determined that nonfederal subsurface rights were to be acquired, all applicable federal regulatory authorities, including the requirements of regulations governing nonfederal oil and gas rights (36 CFR 9B) would be fully applied to any proposed mineral activity in these portions of the preserve.

It is difficult to determine the costs of purchasing nonfederal oil and gas rights if the owner's access to them was denied because most areas off the Sunniland trend have unproved oil and gas reserves. These off-trend areas would include all of the Loop, Stairsteps, and Deep Lake units, and portions of the Bear Island, Turner River, and Corn Dance units, an area encompassing 431,671 acres or 75.1 percent of the preserve. Two other cost categories of oil and gas reserves exist: unproved wildcat reserves in areas on the Sunniland trend and proved reserves near producing fields on the trend. Specific value figures per acre have not been determined for these categories.

In addition to nonfederal oil and gas owners, lessees, and operators, parties with potential leases could also be affected by the proposed action, as could any companies involved with oil and gas development in the preserve. Proposed requirements could increase operating costs, especially for operations south of US 41.

Conclusion. The minerals management proposal could affect mineral interests in three ways: (1) new drilling and production activities in the Bear Island unit would be permitted openly from existing roads and pads, reducing accessibility to potential oil and gas reserves in that unit; (2) access roads, pads, and pipeline corridors would have to avoid vegetation communities and cultural sites identified as important resource areas, resulting in possible increased development cost and the possibility that nonfederal subsurface interests could not be accessed; and (3) the 10 percent acceptable level of development could result in operational delays for mineral owners until other oil and gas sites had been reclaimed. Geophysical activities would be allowed anywhere in the preserve, in accordance with the stipulations of the minerals management plan and the proposed ORV regulations. A final decision to close areas to mineral development would constitute a finding by the National Park Service that these areas are "subject to, or threatened with, uses which are, or would be, detrimental to the purposes of the preserve." The National Park Service would then notify Congress of its intent to acquire the affected mineral interests and would seek appropriations for that purpose.

Cumulative Impacts on Mineral Interests. Three fields could potentially be developed during the next 15 years within Big Cypress National Preserve. Additionally, new oil and gas developments outside the preserve are a possibility and must be considered and analyzed to provide a comprehensive overview of all potential impacts. NPS projections based on the historical drilling pace and success ratio indicate that a total of five fields, including the three projected for the preserve, could be developed in south Florida over the next 15 years. Historically, four wildcat wells per year have been drilled in south Florida, but during the late 1970s and early 1980s, a period of high oil prices, an average of 6.6 wildcat wells per year were drilled.

A review of the literature from the last three years provides a generalization of industry interest in the south Florida basin. Four areas of interest have been identified, including onshore areas of the Sunniland trend, areas southwest of the Sunniland trend, formations other than the Sunniland, and offshore areas.

Onshore areas of the Sunniland trend – All of the active wells in the preserve and all the major discoveries in south Florida have occurred on the Sunniland trend and produce from the Sunniland formation. Two fields within the preserve, Bear Island (discovered in 1972) and Raccoon Point (discovered in 1976), are still producing. The West Felda field, discovered in 1966, is the most prolific field on the trend, with cumulative production of over 37 million barrels of oil (American Association of Petroleum Geologists [AAPG] 1986). A high level of activity on the trend is expected in the future.

A study made by Applegate and Pontigo (Florida Department of Natural Resources 1984) showed that 45 barrels of recoverable oil had been found for every foot of wildcat drilling between 1943 and 1980 in south Florida. If drilling had been confined to the Sunniland trend, the figure would have been more than 100 barrels of oil for every foot of wildcat drilling (Applegate 1986). Applegate also states that this yield of recoverable oil translates into more drilling in south Florida in the future. Mitchell-Tapping (1986) believes that the potential of the Sunniland formation may be greater than expected and may be the site of future major discoveries.

Areas southwest of the Sunniland trend – The presence of oil in the lower Sunniland formation off the trend may be of utmost importance, especially if it is located in a down-dip or southwest location (Applegate 1986). This may have important consequences to the resources of the preserve because the majority of the preserve is southwest of the Sunniland trend. Approximately half of the exploratory wells drilled in south Florida have been off the trend.

Other formations – Other formations have had shows of oil and gas in south Florida besides the Sunniland, and there is some potential that oil and gas could be discovered in them. One such formation, the Trinity C, is currently being evaluated by Exxon. There may also be potential for oil and gas in formations deeper than the Sunniland. At this time very few wells have been drilled deeper, but one of five dry holes drilled south of US 41 went to 16,000 feet, about 4,000 feet deeper than the Sunniland and was not productive. Because of the small amount of data about zones other than the Sunniland, no statistical projections have been made.

Offshore areas – The Sunniland formation, along with three other zones, could have significant hydrocarbon potential offshore in the south Florida basin (AAPG 1986). The Sunniland has produced several million barrels of oil since its discovery in 1943, but this production has never been extended offshore into the eastern Gulf of Mexico.

On the western coast of Florida, the Sunniland formation nearly disappears, but it appears again in wells drilled offshore in the Florida Keys. Oil shows have been recorded from the Sunniland formation outside the Sunniland trend, and there is evidence that the zone extends farther offshore, where it could have major hydrocarbon potential (AAPG 1986). Before the December 1985 outer continental shelf lease sale, oil companies were extremely interested in the offshore areas, but oil prices had already begun to sag, and firms were hesitant to make financial commitments in a frontier region. When the oil industry turns around again, however, these offshore areas may be in great demand (AAPG 1986).

Mineral owners outside the preserve, particularly those with mineral interests located on the Sunniland trend northwest of the preserve, may be positively affected by the implementation of the proposed action. The restrictions placed on mineral owners and operators within the preserve under the proposed action could increase demand for mineral resources on the trend outside the preserve, where requirements are somewhat less rigorous and numerous. Once significant discoveries are found anywhere on the trend, exploration activity will likely increase all along the trend, both inside and outside the preserve.

UNAVOIDABLE ADVERSE EFFECTS

Approximately 4 acres of surface water flow would be displaced by proposed NPS developments for visitor use. Even with the proposed resource protection measures, it is expected that 203 acres of surface water flow would be displaced by future oil and gas activity.

There would continue to be unavoidable impacts on surface water quality from oil- and gas-related spills and leaks. The volume of spills would vary from 10 to 6,000 gallons; most would be small and cover less than 0.25 acre. In a worst case situation, with high water and a delayed response time for cleanup, up to 100 acres could be affected by a major spill. Spills or leaks that occurred in wetlands could potentially adversely affect cypress strands / mixed-hardwood swamps / sloughs, cypress domes, marshes, and mangroves in Big Cypress and, if south of US 41, in Everglades National Park.

Continued use of herbicides for control of exotic plants would have unavoidable adverse effects on water quality. However, concentrations of herbicides would be monitored to ensure that application levels were within regulated standards.

Approximately 1.5 acres of cypress strand / mixed-hardwood swamp / slough, 1 acre of marsh, and 1 acre of hardwood hammock would be displaced for NPS visitor developments. An additional 15 acres of disturbed area on hardwood hammocks would be affected by backcountry camping.

Even though the proposed actions are expected to improve overall conditions for the Florida panther, human activity in known or potential panther habitat would continue. Any expansion of oil and gas development in the preserve would have some potential for degrading panther habitat, and some areas of known panther activity would continue to be occupied. The proposed action would reduce but not eliminate hunting, ORV use, and other recreational activity in known panther areas. The levels of proposed activities are believed to be compatible with panther behavior, but some risk of adverse impact is unavoidable if the recreational purposes of the preserve are to be met and the right of access to privately owned minerals upheld.

There would be unavoidable adverse effects on the level of hunting and ORV use in the preserve. Opportunities for hunting would be decreased by 25 to 50 percent (compared to the annual average between 1980 and 1986). Hunters who use dogs for deer and hog hunting would be even more restricted. The total mileage of ORV trails open to visitors would decrease by an estimated 37 percent, and approximately 114 owners of tracked vehicles would no longer be able to use them in the preserve. There would be a general increase in formal regulation of backcountry recreation, which would adversely affect the experience of many recreationists accustomed to less restricted conditions.

Increased regulation of hunting and ORV use could adversely affect property values of backcountry exempt inholdings by limiting the recreational opportunities assocated with these properties. Although ORV access would be permitted for all backcountry exempt inholders, some could be inconvenienced by restrictions on ORV trails.

Prohibiting surface occupancy for oil and gas drilling and production in vegetation communities and cultural sites identified as important resource areas, and prohibiting further surface occupancy in the Bear Island unit, would have potential unavoidable adverse effects on mineral owners, lessees, and operators by limiting their access to petroleum resources. However, mineral owners would be compensated at fair market value for any loss of mineral interests due to a denial of a plan of operations.

THE RELATIONSHIP BETWEEN SHORT-TERM USES AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed actions that would limit the expansion of oil and gas development, decrease the level of hunting and ORV use, increase interpretive and passive recreational opportunities for the general public, and improve management of hydrology, fire, and exotic species would contribute to the long-term productivity of all biological resources considered in this document except feral hogs. Productivity of feral hogs would be managed only so long, and only in selected locations, as hogs are deemed to be an important alternate prey for Florida panthers. If feral hogs were no longer considered essential to panther survival, hog populations would be controlled or eradicated as an exotic pest species, and their productivity would cease. Proposed actions are intended to support regionwide, multiagency actions to maintain and enhance the long-term productivity of the Florida panther.

Approximately 7 acres of vegetation and soils would be removed from natural productivity for NPS developments to provide for public education and recreation. Another 25 acres of existing disturbed land would be occupied for NPS backcountry campsites. Natural processes, and hence long-term natural productivity, would be restored to an estimated 38,000 acres of land affected by altered surface water flows, 460 acres affected by ORV use, and upwards of 25,000 acres affected by melaleuca and other exotic plants.

Approximately 203 acres, primarily second-growth pinelands and prairie, would be removed from long-term natural productivity by oil and gas development. An estimated additional 35,500 acres would be within the area of influence for oil and gas development, and the natural productivity of some species of wildlife would be affected. The quality of experience for visitors in this area could also be adversely affected. Precluding oil and gas operations from 90 percent of the preserve at any one time would offer long-term protection of the natural values and public benefits for which the preserve was established at the expense of short-term, private economic gains.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The Florida panther is perhaps the most sensitive natural resource in south Florida, and many believe it to be on the brink of extinction. Any action that led to losses of individual panthers, their prey, or the quality of panther habitat would contribute to the loss of the species as an ecological and genetic resource. The proposed action is designed to improve conditions for the panther in Big Cypress and is in keeping with management actions prescribed by the *Florida Panther Revised Recovery Plan* (USFWS 1987a). However, oil and gas development would be allowed to expand to a limited extent within panther range, and human activity (including hunting, hiking, ORV use, and overnight camping) would also continue, but at reduced levels and restricted locations. Although unlikely, it is conceivable that the proposed actions would be inadequate for protecting the panther and would inadvertently contribute to its decline. It is expected that proposed research and monitoring would help avoid this situation.

Under the proposed action the National Park Service would protect all archeological resources to the extent practicable. Some sites could be subject to damage from ORV use, peat fires, or vandalism, resulting in irreversible and irretrievable losses of artifacts and cultural information of regional or local significance.

The proposed action would permit the continued extraction and eventual use of privately owned oil and gas within allowable limits. Any oil and gas actually removed would be irreversibly and irretrievably lost. Actions required for the exploration and production of oil and gas could result in the irreversible and irretrievable alteration of pre-disturbance vegetation communities. The minerals management plan would only require 80 percent reclamation of areal coverage and species composition within three successive growing seasons or five years (see appendix C). One hundred percent recovery of some communities, such as second-growth pinelands, might be so long term that the effects could be considered to be irreversible and irretrievable.

STATUS QUO ALTERNATIVE

IMPACTS ON SURFACE WATER FLOWS

Analysis. Under the status quo alternative the major effect on surface water flows would be continued disruption because of inadequate drainage under the Loop Road and the Bear Island Road and because of diverted surface flows due to the Turner River, Birdon Road, and Wagonwheel Road canals. As much as 38,000 acres could be adversely affected. Of the total, about 3,000 acres of land adjacent to the canals have reduced hydroperiods 65 percent of the time because of the accelerated drainage caused by the canals (NPS, Rosendahl and Sikkema 1981d). Hydrologists estimate that the Loop Road could be increasing hydroperiods by blocking drainage north of the road for as much as 2 miles and could be reducing hydroperiods a similar distance south of the road, affecting a total of 28,000 acres. Inadequate drainage under the Bear Island Road could be restricting high-water surface flows from Okaloacoochee Slough to East Hinson Marsh. If this is the case, as much as 7,000 acres of East Hinson Marsh could have partially reduced flows during high water periods.

In addition, unreclaimed, abandoned roads and fill sites would continue to divert or impound surface water, affecting perhaps 100 acres in total.

To date geophysical activity (the placement of seismic lines) has affected an estimated 474 miles (858 acres) of the preserve (see Existing Oil and Gas Development Areas of Influence map). Many of the lines that were developed from 1971 to 1984 were visible on aerial photographs taken in 1984 by the U.S. Geological Survey, and NPS field inspections have verified their presence. Under the status quo alternative anticipated future geophysical activities, which could occur anywhere in the preserve, could affect an estimated 433 additional miles (524 acres), some of which would occur within wetlands subject to periodic surface flow. Adverse effects from sediment mounds created during the drilling of shot holes, which could alter water flows, would have to be mitigated in accordance with the stipulations in the approved plan of operations. Limestone caprock could collapse around some drill holes, resulting in the formation of sinkholes, ponding, and vegetation changes (for example, cattail invasion). These impacts would probably not be easily mitigated.

Past and present drilling and production activities have displaced 259 acres, and potential future development would displace an estimated 215 additional acres, including 40 miles of access roads and pipelines. Under this alternative, drilling and production activities could occur anywhere in the preserve. If oil and gas development occurred south of US 41, surface water flows could be disrupted and could cause adverse effects on the Ten Thousand Islands estuary in Everglades National Park. Hydrologic relationships in the Stairsteps and Loop units and the adjoining area of Everglades are highly sensitive, and the extent of impacts would depend on the location and scale of the potential petroleum development. Adverse hydrological effects, such as ponding, altering flow velocity and patterns, and water temperature changes, could occur in an area 500 feet on any side of development, as discussed in appendix B.

Only limited, localized effects would occur due to continued use of existing ORV trails and NPS developed sites.

Conclusion. As estimated 38,000 acres of wetlands would continue to be adversely affected by altered surface water flows. There would be no new displacement of surface water flows from NPS developments. Anticipated future oil and gas activity could displace up to 215 additional acres. The displacement from drilling and production could occur anywhere in the preserve, and the limitation on oil and gas development effects to 10 percent of the preserve at any one time would not apply. Consequently, overall oil and gas impacts are expected to be the highest of any alternative.

IMPACTS ON WATER QUALITY

Analysis. Existing water quality threats would continue under the status quo alternative (see general discussion under the proposed action). The continued expansion of oil and gas operations would result in over twice as many wells in operation, and spills and leaks of petroleum-related products would probably increase proportionately. Most spills would affect less than 1 acre, and there would continue to be a low risk for large spills. As described under the proposed action, a risk to groundwater would also continue. The frequency and extent of past groundwater contamination has not been systematically monitored; therefore, the risk cannot be quantified. However, the status quo alternative would permit the greatest degree of petroleum development, and the degree of risk would increase proportionately with development.

Under the status quo alternative water pollution from oil and gas operations could occur in any unit of the preserve. If operations were renewed south of US 41, a major spill or pipeline leak could adversely affect water quality in Everglades National Park, as well as Big Cypress. In 1986 an oil pipeline break in conservation area 3A, where habitats are similar to those found in the southern Big Cypress, resulted in a discharge plume 4 miles long and 200 feet wide, totaling about 100 acres. Even though risks of major spills are believed to be low, such an event would violate one of the basic purposes for the establishment of the preserve – to protect water quality in Everglades National Park.

Past geophysical activity has affected 474 miles (858 acres) in the preserve. Anticipated future geophysical development, which could occur anywhere in Big Cypress under the status quo alternative, could affect an additional 433 miles (524 acres). Unless the stipulations contained in an approved plan of operations were applied and monitored, water quality could be affected by turbidity caused by drilling and vehicle use, changes in pH due to limestone cuttings and bentonite, and fluids discharged from vehicles and equipment. Groundwater disruption from drilling shot holes could impact water quality, but this effect has not been researched in the preserve.

Past drilling and production activities have displaced 259 acres, and potential future development could displace an estimated 215 acres. Adverse water quality impacts – such as turbidity, sedimentation, spills of contaminants (production fluids, crude oil, and brines), water use (possible aquifer contamination), and construction wastes – could occur up to 1,000 feet on any side of developments, as discussed in appendix B.

The lack of toilets and sewage disposal stations for recreation vehicles at existing campgrounds could result in the continued illegal discharge of as much as 6,000 gallons of raw sewage annually. This condition is an important sanitation and public health concern.

Continued unregulated backcountry camping could cause some localized water quality problems, but because of low use, this is not believed to be an important threat to preservewide water quality. Similarly, continued ORV use appears to cause only localized turbidity problems and is not a serious threat to overall water quality (Duever et al. 1986b).

The risk of accidental pollution from fuels, pesticides, or other materials as a result of NPS operations would continue to be very low. As described under the impacts of the proposed action, no significant accidents have occurred to date. The use of herbicides for exotic plant control would continue at about 0.2 gallon per acre, with a total coverage of approximately 1,000 acres per year. Water quality would be periodically monitored to ensure that pesticide concentrations were below state and federal standards.

Conclusion. Under the status quo alternative current threats to water quality would continue. The risks of petroleum-related pollution would increase, as would the illegal discharge of raw sewage from recreational vehicles. Water quality in Everglades National Park could be adversely affected if petroleum developments occurred south of US 41. Water quality could be affected by drilling, production, and geophysical activities on up to 739 acres. Under the status quo alternative, these effects could occur anywhere within the preserve, and no limitation on the area of total effect would be proposed. As a result, the overall impacts on water quality from oil and gas activities are expected to be the highest of any alternative.

IMPACTS ON CYPRESS STRANDS / MIXED-HARDWOOD SWAMPS / SLOUGHS AND CYPRESS DOMES

Analysis. Under the status quo alternative approximately 11,000 acres of cypress strands, mixed-hardwood swamps, and sloughs around the Turner River canal and the Loop Road would continue to be subject to abnormal hydroperiods. Those communities adjacent to the Turner River Canal and south of the Loop Road, about 6,000 acres, would continue to have shortened hydroperiods and more frequent fires. Consequently, gradual invasion by pine, wax myrtle, and other plants that require a shorter hydroperiod would continue. About 5,000 acres of strand / swamp / slough north of the Loop Road would continue to have artificially extended hydroperiods due to the road's impoundment effect. In this area the mixed-hardwood swamp component could expand over many decades into existing cypress strands, and cypress strand vegetation could invade adjacent flooded prairies.

Continuing existing fire management would probably maintain the approximate distribution of strand / swamp / slough and dome types over the next decade. However, without expanding the existing prescribed fire program to control fuel levels in the interior of the preserve, the risk of large wildfires during drought years would increase. If a wildfire was similar to the 1981 Turner-10 fire, which burned over 200,000 acres, it could damage cypress strands and cypress domes by burning organic soils. In such cases, some cypress-dominated stands could be converted to willow thickets or open water (Forest Service, Wade et al. 1980a). Cypress strands and domes south of the Loop Road and adjacent to the Turner River canal would probably be the most vulnerable due to artificially shortened hydroperiods.

Continuing the existing level of melaleuca control would result in a modest decrease of a few hundred acres in infested strands / swamps / sloughs and domes. Current efforts to control exotic species have been fairly successful in testing methods to remove melaleuca. However, manpower and budget constraints have made it impossible to remove large areas of melaleuca and to follow up removal with periodic treatment for exotic seedlings and sprouts. Without intensifying the exotic control program, melaleuca could continue to expand in the vicinity of the Loop Road and US 41 and in the Raccoon Point area. About 1,000 acres of strands, swamps, and domes south of the Loop Road would be especially susceptible to the spread of melaleuca because the area already harbors scattered melaleuca trees, and the shortened hydroperiod caused by poor drainage under the road enhances melaleuca seedling establishment.

Oil and gas operations would be encouraged to avoid affecting cypress strands / mixed-hardwood swamps / sloughs and cypress domes under the status quo alternative, but some occupation of this vegetation type could occur. If so, the acreage involved would probably be moderate, less than 100 acres. As described under water quality impacts, there would be a low but increased risk of accidental spills or leaks of petroleum-related pollutants. Up to 100 acres of strand / swamp / slough and cypress dome communities would be damaged if such an accident occurred. These important resource areas would be open to geophysical activities, but they would be protected from vehicle access if an approved plan of operations included such stipulations.

No new NPS development would affect strand / swamp / slough or dome vegetation. Approximately 84 miles of existing ORV trails would continue to occupy an estimated 150 acres of wetlands.

Conclusion. About 11,000 acres of cypress strand / mixed-hardwood swamp / slough and cypress domes would continue to be subject to artificial changes because surface flows would continue to be altered by the Loop Road and Turner River canal. Some direct and indirect impacts from oil and gas development could occur.

IMPACTS ON MARSHES

Analysis. Continuing current management would probably maintain the general distribution of marshes in the preserve, but gradual changes in species composition could occur in some marshlands without more active management. Of particular concern is the spread of melaleuca, which has already invaded 500 acres of marsh south of the Loop Road. Melaleuca reproduction could be aided in that area by a reduced hydroperiod. It is estimated that the impoundment effect of the Loop Road could be directly reducing hydroperiods for 2 miles downgradient of the road (David Sikkema, personal communication 1987). If this was the case, about 6,000 acres of marsh would continue to be affected and would be more susceptible to melaleuca invasion. Even without the spread of melaleuca, this area would be subject to more frequent wildfires, shifts in species composition toward prairie grasses and sedges, and invasion by native shrubs such as wax myrtle and palmetto. Under existing management practices, attempts would be made to control melaleuca and fire in marshes, but without expanding current programs and correcting the basic hydrological problem of the Loop Road, some long-term changes in plant composition would probably be unavoidable.

Similarly, there appears to be a shift in plant composition in marshland south of US 41 near Ochopee, possibly because of the diversion of natural surface flows caused by the Turner River canal and other roadside canals in the area (NPS, Bass and Kushlan 1982h). Without corrective actions, this trend toward shorter hydroperiod species would continue. Over 1,000 acres are believed to be affected.

The existing extensive network of ORV trails in marshes (an estimated 250 miles, occupying 450 acres) would remain under the status quo alternative. Most of trails (220 miles) are in the Stairsteps unit. Continued, unregulated use of tracked and tractor-tired vehicles in marshes would be likely to cause additional damage to vegetation and soils, particularly in the marshland south of Pinecrest where tracked vehicles are most active. An estimated 10 to 20 additional acres could be affected.

The risk of marshes being adversely affected by oil and gas activity would increase, even though new oil and gas drilling and production activities in marshes would be discouraged. East Hinson and other marshes in the Bear Island unit, which is within known oil reserves on the Sunniland trend, would be the most threatened by expanded construction of roads, pads, and pipelines or by accidental spills or leaks of pollutants from petroleum operations. As yet there are no known, economically viable oil deposits under marshes in the Stairsteps unit, and the probability of new oil field development here is believed to be low. Geophysical activities would be permitted anywhere in the preserve, including marshes.

There would be no new impact from NPS development on marshes in the preserve.

Conclusion. Even though continuing existing trends would be likely to maintain the general distribution of marshes in the preserve over the next few years, there could be long-term losses of marsh vegetation over several thousand acres of the Stairsteps unit.

IMPACTS ON MANGROVE FORESTS

Analysis. Continuing present management policies would have no new impacts on mangrove forests unless oil and gas discoveries were made in the Stairsteps or Loop unit. Petroleum development in these units would result in an increased risk of accidental spills or leaks affecting mangroves in Big Cypress or Everglades National Park. As much as 100 acres could be adversely affected by a single spill. Mangroves would be avoided, if possible, for all exploration and production operations.

Conclusion. The status quo alternative would cause no additional impacts on mangroves except for accidental spills or leaks from possible oil and gas development in the Stairsteps and Loop units. Mangroves could be affected by direct and indirect impacts from geophysical, drilling, or production activities.

IMPACTS ON OLD-GROWTH PINELANDS

Analysis. Continuing current management practices would protect much of the existing old-growth pinelands. However, without expanding the current fire management program there could be long-term, incremental losses of individual stands or trees. Losses would occur either because of hardwood invasion, leading to diminished pine reproduction and the eventual crowding out of canopy pines by shade-tolerant hardwoods, or because of the direct destruction of old-age trees by intense crown fires caused by high fuel accumulation.

Approximately 50 acres of old-growth pinelands would be subject to expanded melaleuca invasion.

Debris from about 60 former trespass camps in old-growth pinelands would probably remain. Because of budget and manpower constraints, cleanup of such sites could take several years.

About 30 miles of ORV trails occupying about 54 acres of old-growth pinelands would remain.

Even though oil and gas activity would be discouraged in old-growth pinelands, it would not be prohibited. Probably less than 100 acres would be directly affected.

Conclusion. The status quo alternative would protect much of the existing old-growth pinelands in the preserve, but limits on prescribed burning could result in incremental losses of stands and trees.

IMPACTS ON HARDWOOD HAMMOCKS

Analysis. If existing trends continued, debris from the removal of as many as 145 trespass properties (including 80 existing camps to be removed) would take many years because of budget and manpower constraints. The presence of this debris would delay the natural vegetation restoration or the use of selected sites for public backcountry camping.

ORV trails (15 acres occupied) and NPS development actions would not cause any new impacts on hardwood hammocks.

The existing fire management program would continue to protect most hammocks in the preserve. However, without expanding the prescribed burning program, the risk would be greater for fire damage or loss of hammocks during periods of drought due to high fuels in surrounding vegetation.

Without an increase in control efforts, melaleuca could invade up to 100 acres of hardwood hammocks.

Continued expansion of oil and gas operations would pose little threat to hardwood hammocks because these areas would be avoided if possible.

Conclusion. Continued existing trends would increase the risk of melaleuca invasion and fire damage to hammocks.

IMPACTS ON FLORIDA PANTHERS

Analysis. Under the status quo alternative direct mortality to panthers from automobile accidents, illegal shooting, and accidents relating to research would continue. Panther/automobile accidents on US 41 would continue at the current rate of about one accident every four years. However, the construction of I-75 (an action that is independent of the general management plan) would reduce traffic-related panther deaths along that highway corridor because wildlife underpasses would be provided. Illegal shootings of panthers would probably continue at least at the current rate of one death every 1.3 years. As described for the proposed action, accidental panther deaths as a result of research activities (currently one death every four years) would probably decrease because of improved immobilizing drugs and more experienced researchers applying the drugs.

Continuing the current fire management and hunting programs would likely decrease the prey base for the Florida panther compared to current levels. The lack of habitat improvement programs in the interior of the preserve would result in a decline in habitat quality for white-tailed deer, hogs, and other panther prey in much of the preserve. Within three to five years after fires in many vegetation types in Big Cypress, the palatability and nutritional content of available forage rapidly deteriorate without fire, thereby reducing the carrying capacity for both prey and panthers.

The effects of continuing the current hunting program are uncertain. Some authorities believe that hunting may be already adversely affecting panther prey populations (Florida Panther Technical Advisory Council 1985), while others question this opinion (Downing et al. 1986). Maintaining existing hunting regulations would probably lead to increased deer harvests over the life of the general management plan because the number of deer and hog hunters would increase along with the regional human population.

The status quo alternative would not control the increase of human activity in panther habitat in the Big Cypress backcountry. Increased hunting, use of hunting dogs, ORV use, backcountry camping, and petroleum activity – particularly in the Bear Island, Deep Lake, and Corn Dance units – could adversely affect panther movements and ultimately panther survivorship and recruitment (see the impact discussion under the proposed action).

Disturbance and occupancy of panther habitat by oil and gas operations could be greatly expanded under the status quo alternative. Petroleum development could affect panther movements and their use of adjacent lands. With maximum development, panther home ranges could be adversely affected, and the long-term capacity of the preserve to support panther recruitment could be reduced.

Conclusion. Under the status quo alternative, current risks to panthers would continue, and there would be few controls over increasing human activity in panther habitat. Panther habitat quality could decline, and prey populations could decrease.

IMPACTS ON CAPE SABLE SEASIDE SPARROWS

Analysis. Continuing current efforts to manage Cape Sable seaside sparrows within the preserve would maintain the majority of the preserve's sparrow population and habitat, which includes approximately 48,000 acres in the Stairsteps unit. However, without systematic monitoring, the effectiveness of management programs could be reduced, and localized habitat degradation could occur. Several hundred acres of former sparrow habitat in the Ochopee area, perhaps 2 percent of the total habitat, would remain unavailable for reoccupation.

Under the status quo alternative future oil and gas development could conceivably cause sparrows to abandon or be displaced from a portion of their habitat, but the potential for such development, based on existing geological information, is low.

Conclusion. Continuing existing management programs would maintain the large majority of the existing Cape Sable seaside sparrow habitat and populations. There would be a low risk of future displacement or abandonment of some habitat as a result of oil and gas development.

IMPACTS ON RED-COCKADED WOODPECKERS

Analysis. Current management actions for the red-cockaded woodpecker include (1) annual monitoring of colonies, (2) periodic prescribed burning to maintain old-growth pinelands at 24 known woodpecker colonies, (3) and prohibiting oil and gas activity within 1,865 feet of known nesting sites. Continuing these practices would sustain existing colonies. Even though oil and gas development could be considerably expanded under this alternative, adverse effects on existing colonies could be avoided or mitigated by the existing safeguards.

Other than burning to maintain known woodpecker colonies, the existing prescribed fire program concentrates on hazardous fuel reductions along major roads; there is less emphasis on burning in interior pinelands because of budgetary and manpower constraints. Continuing this pattern of burning could result in a decrease in pinelands available for future red-cockaded woodpecker occupation. The total acreage of pinelands, both old-growth and immature stands, would decline as a result of unchecked hardwood invasion and intense wildfire caused by high fuel accumulations. The scale of potential pineland losses is difficult to estimate but could run into thousands of acres.

Conclusion. The status quo alternative would adequately protect existing red-cockaded woodpecker colonies; however, there could be a modest loss of immature pinelands, which are potential habitat for future woodpecker occupation.

IMPACTS ON BALD EAGLES

Analysis. Any oil and gas geophysical, exploratory drilling, or production activities approved in the Stairsteps unit in the vicinity of known bald eagle nests would be subject to an approved plan of operations. All proposed operations would also be subject to the provisions of the Endangered Species Act.

Conclusion. Impacts to bald eagles from oil and gas activities would be low, given the required safeguards.

IMPACTS ON *LIGUUS* TREE SNAILS

Analysis. Continuing existing management practices would protect *Liguus* tree snail habitat in hardwood hammocks. No new development would be permitted in hammocks, and hammocks would be protected from wildfire.

Unlike the proposed action and other alternatives, the status quo alternative would not limit the number of shells that could be collected. Collectors would continue to be asked to limit themselves to 10 shells per color form per day, but no limit would be enforced. It is not known if tree snail populations would be threatened by overcollecting; but some experts are doubtful that collecting alone could jeopardize populations (Archy Jones, personal communication 1985). Without a limit on collecting, tree snail populations could conceivably be adversely affected.

Prohibitions on transferring tree snails between hammocks and introducing new color forms would continue. This would maintain the genetic integrity of existing *Liguus* populations and prevent further disruption of natural distributions.

Stipulations in an approved plan of operations would prevent vehicle access for geophysical activities in snail habitat in hardwood hammocks. Drilling and production activities would be avoided, if possible, in hammocks under the status quo alternative, so the likelihood of direct impacts on *Liguus* tree snails would be low.

Conclusion. *Liguus* tree snail habitat would continue to be protected. Without enforcement of limitations on the number of shells that could be collected, populations could conceivably be adversely affected, but the risk appears to be low.

IMPACTS ON WHITE-TAILED DEER AND FERAL HOGS

Analysis. Continuing the prescribed burning program at the current level could result in decreased habitat quality and lower productivity of white-tailed deer and feral hogs. Reducing hazardous fuel levels only along major roads and around developed areas would tend to lengthen fire cycles within the interior of the preserve. Mature vegetation in much of the unburned area would be unsuitable for browse and forage, and it would be less palatable and have a lower nutrient content. In some locations hazardous fuel levels could result in large, intense fires that could threaten mast-producing hardwood hammocks. To some extent the lack of prescribed fire would be compensated by increased wildfire, but there would be no certainty that wildfires would occur with the frequency or intensity needed to benefit deer and hog populations.

Continuing the existing exotic plant control program would not guarantee the total containment of melaleuca, and some additional deer and hog habitat could be lost. Melaleuca tends to invade prairies and cypress prairies most heavily, but once established it takes over more productive habitats as well. It is impossible to predict how much deer and hog habitat would be affected, but habitat losses due to invasion by exotic species could be significant.

The Turner River canal and canals along Birdon and Wagonwheel roads would continue to drain approximately 3,000 acres north of Ochopee, and the Loop Road would continue to obstruct sheet flow in the Loop and Stairsteps units, affecting perhaps 28,000 acres. Subtle changes in the distribution of deer habitat would occur over the years, but within the 10-year life of the general management plan the changes would probably not be significant.

Frontcountry development under the status quo alternative would not cause any new impacts on deer or hogs. The effects of oil and gas operations would depend on the extent of future development. If historical trends continued, development could affect up to 215 additional acres. Disturbance to deer and hogs could occur because of human presence and the associated visual, noise, odor, and night-lighting impacts; deer would probably more readily habituate to such disturbances than wild hogs (see the impact discussion under the proposed action).

With the exception of the Loop unit, where ORVs would continue to be prohibited, there would be few regulations governing ORV access to most of the preserve. If ORV use continued to increase, a larger area and more vegetation would be affected. Vegetation impacts alone would probably not have much of an effect on deer and hog habitat. However, disturbance to deer, hogs, and other wildlife from continued intensive use of ORVs, especially in association with hunting, could have an influence on populations. Human activity in the Big Cypress backcountry would remain extensive. Even though the effects of disturbances have not been studied in Big Cypress, adverse effects on wildlife health, movements, densities, and reproduction have been documented elsewhere (see discussion of impacts under the proposed action). Such impacts may be occurring now and would continue under the status quo alternative. Deer and hog populations would still be sustained, but not necessarily at densities beneficial to the endangered Florida panther.

Hunting harvests of white-tailed deer and hogs, as well as the number of hunters, would probably increase. Even though the deer herd would recover annually from the hunting harvest, deer densities would be suppressed from mid-November, when the majority of deer are harvested, through at least early spring when fawn drop peaks (Loveless 1959). If estimates by Harlow and Jones (FGFWFC 1965) of legal, illegal, and crippling losses are correct, then the deer herd could be reduced annually over the winter months by up to 18 percent. Estimates are not available for wild hogs, but a similar pattern of reduced densities would be expected. It is not known what effects, if any, the continuation of this seasonal reduction in prey base would have on the Florida panther, but concerns about possible adverse effects have been raised by the U.S. Fish and Wildlife Service (1987a) and other management agencies.

Continuing current levels of bucks-only hunting would mean that the deer herd would remain fairly young (particularly for bucks rather than does), does would tend to outnumber bucks, and potential reproduction would be relatively high. Both sexes of hogs are hunted; consequently, hog populations would be more susceptible to long-term reductions from continued hunting pressure, and in the absence of restocking, hogs could be significantly reduced in some sections of the preserve. In-migration and illegal releases of hogs would continue to be a problem.

Conclusion. Under the status quo alternative habitat quality for deer and hogs could decline over much of the preserve, and populations could be somewhat suppressed as a result of intense backcountry use.

IMPACTS ON AIR QUALITY

Analysis. Unlimited oil and gas developments could occur throughout the preserve under the status quo alternative, with potential for air quality impacts as described under the proposed action. Because oil and gas development could be much more extensive under this alternative, the collective impacts could be of greater concern. Mitigating measures could help to offset any significant adverse effects.

Effects on air quality as a result of prescribed fire management programs would be temporary.

Conclusion. Increased oil and gas activity would likely increase negative impacts to the air quality of the preserve, but the level of impact is unknown.

IMPACTS ON CULTURAL RESOURCES

Analysis. Unrestricted ORV use and the potential for increased ORV activity in the future would continue to jeopardize cultural sites. Active management would continue on a limited scale and only at selected cultural sites. Hot fires and burrowing animals could continue to cause damage.

Impacts on cultural resources as a result of oil and gas development should be minimal. Because virtually all of the 395 identified archeological sites are on hardwood hammocks, and because these hammocks would be protected if possible, the likelihood of adverse effects would be slight. The Miccosukee and Seminole Indian cultural sites would be avoided.

Conclusion. Active management of cultural sites would continue to be severely limited. Increased recreational activity and potential oil and gas development would continue to jeopardize cultural resource sites. This alternative would not meet the intent of NPS policies or historic preservation laws and regulations.

IMPACTS ON HUNTERS AND HUNTING

Analysis. Hunter-days for the general gun season dropped from 19,990 in 1984-85 to 13,865 in 1985-86 (FGFWFC 1986). The drop is attributed to a 1985-86 change in the regulation to prohibit the use of ATVs for hunting and the new regulation to prohibit the use of dogs for deer hunting with the exception of the first nine days of the general gun season. With expected increases in the regional population and with the continuing regulations to prohibit ATVs, hunting would be expected to increase at a slow but steady rate in the preserve over the life of this plan. This assumes that the cost of customized swamp buggies and airboats, which are capable of penetrating the backcountry, would remain high and would be beyond the financial means of many hunters. Consequently, any increases in hunting pressure would be expected to be greatest along or near roads. However, technological changes that would make ORVs less expensive could cause dramatic increases in hunting pressure in the preserve, as did ATVs in the early 1980s.

Big Cypress would remain a very attractive hunting area because there is only one other game management area in Florida that provides a wider range of hunting opportunities and methods. The broad range of hunting opportunities would continue to be available, and no limit or ceiling on the number of hunters would be established.

With gradual increases in hunting pressure over time, which could be expected under present trends, some hunters could notice a decline in the quality of the hunt due to crowding. It is also possible that the hunter success rate could decrease as more hunters used the preserve. If law enforcement and monitoring were inadequate as a result of budgets, illegal hunting would likely increase. Hunting data collection would be further hampered because quota permits would still be transferable, making the accurate determination of hunting pressure extremely difficult. The 60-day general gun season also would make it difficult for law enforcement officers to effectively monitor the entire season.

No additional areas of the preserve would be closed to hunting as a result of the need to designate safety zones around visitor use developments. However, more safety zones would be designated around future oil and gas pads and access roads.

Abandoned oil and gas pads in the Bear Island unit that are currently used for camping sites would no longer be available for such use if the pads were reoccupied by oil and gas operations. Increased oil and gas development would also create visual and noise intrusions in the natural setting and would affect the experience of many hunters.

Conclusion. Big Cypress National Preserve would continue to be one of south Florida's most popular hunting areas, providing a wide range of hunting opportunities. With the exception of the first nine days of the 60-day general gun season, no hunter would be denied the opportunity to hunt in the preserve. For some hunters, both the kill success rate and the quality of the hunt could decrease as a result of a gradual increase in hunter pressure over the life of the general management plan.

IMPACTS ON ORV USERS

Analysis. As the regional population and the demand for open space increases, the popularity of ORVs would continue to grow. (Based on market surveys, ORV use could increase by 14 percent or more by the year 2000). Because the Park Service does not have a ceiling or limitation on ORV use, such use could become so popular as to detract from the experience of other visitors, including other recreational ORV users. The experience of long-time recreational ORV users, who have traditionally enjoyed the solitude and remote character of the preserve, could be particularly degraded.

ORV users would have unrestricted access in the preserve. Approximately 70 undesignated access points would continue to be used, resulting in congestion, soil erosion, and gradual expansion of disturbance into wetlands. Entering and exiting undesignated staging areas would continue to jeopardize user safety.

ORV users would not be directly informed about the need to protect certain resources and to avoid ORV use in these areas. Without this information, important resource values could deteriorate.

Some ORV trails could be displaced by oil and gas access roads, and access roads and megapads could also act as barriers to ORV travel. Because both ORV use and oil and gas development under the status quo alternative would be relatively unrestricted, there could be increased conflicts between the two users.

Conclusion. Recreational ORV users would be able to move freely throughout the preserve except for the Loop unit. No restrictions would be placed on where or how many ORV users could enter the preserve. Without limiting ORV numbers, the preserve could potentially become a very popular area in the region for recreational ORV activity not related to hunting. Subsequent overcrowding could lower the quality of the recreational experience for all preserve users. Without information about important resource areas, and which areas would be avoided, ORV users could contribute to the long-term deterioration of some resources and thereby diminish the overall user experience.

IMPACTS ON OTHER VISITORS

Analysis. Unrestricted ORV use in all units (except the Loop unit) would continue to result in conflicts between ORV users and hikers, especially along the Florida National Scenic Trail.

Tourists, hikers, and other general visitors would use the preserve less between October and February to avoid the various hunting seasons.

Visitors would continue to have limited opportunities to learn about the preserve and to appreciate its purpose and significance within the national park system.

Oil and gas development could be much more extensive under the status quo alternative than under the proposed action. If production was actually increased, and if activities were not screened by various techniques to reduce their visibility, the visitor experience could be adversely affected by industrial intrusions in a natural setting.

Conclusion. Significant conflicts would continue between hunters/ORV users and other visitors. Many tourists would continue to use and pass through the preserve without any understanding of its purpose or significance. Increased oil and gas production could diminish the experience for visitors if the intrusions were not screened to reduce their visibility.

IMPACTS ON NONFEDERAL PROPERTY OWNERS

Analysis. Inholders as ORV users would continue to be free to move throughout the preserve, except for the Loop unit, which would continue to be closed to ORV use. Frontcountry property owners could still enter the preserve on ORVs from their properties without restriction. Undesignated backcountry camping could result in potentially more conflicts with backcountry inholders.

Inholders would be guaranteed the opportunity to hunt all types of legal game on a yearly basis. They would still have a broad range of options for hunting with dogs.

Inholders along the Loop Road would still be relatively isolated. Law enforcement assistance would continue to be a problem because of remoteness and difficult road access.

Without an increased prescribed burn program, backcountry inholders could be subject to more frequent hot fires that could threaten life and property.

A maximum oil and gas development level would not be established, and the potential for direct or indirect impacts on private backcountry inholders would become greater as development levels increased. Even though the rights of inholders would be considered in the review of all proposed plans of operations, visual intrusion, noise, and a greater overall level of oil and gas activity could occur near exempt inholdings. Frontcountry inholdings would likely be affected by increased oil- and gas-related traffic along US 41.

Oil and gas development on state inholdings would continue to be controlled under NPS regulations. Petroleum development on Jetport lands could become inconsistent with management of the rest of the preserve without a management agreement between the National Park Service and the Dade County Port Authority, even though oil and gas activities are currently being managed consistent with NPS regulations.

Conclusion. Inholders would be free to use ORVs throughout the preserve, except for the Loop unit. Conflicts between inholders and other ORV users could increase because ORV use would not be limited. There would be little change in traditional use patterns and activities. Direct and indirect impacts on inholders as a result of oil and gas development could increase.

IMPACTS ON MINERAL INTERESTS

Analysis. Under the status quo alternative no additional requirements would be placed on oil and gas well operators over and above those described at 36 CFR 9B, and production would continue under existing regulations. The only restrictions on oil and gas development would be adherence to the state's spacing requirements and the avoidance of important resource areas, if possible. Development levels could expand as demand warranted and no acceptable level of development would be established.

Conclusion. Under the status quo alternative there would be minimal effects on mineral interests. Oil and gas exploration and development would continue under present regulations (36 CFR 9B).

IMPACTS ON SURFACE WATER FLOWS

Analysis. Under alternative A, as with the proposed action and alternative B, more natural surface flows and hydroperiods would be restored to as much as 38,000 acres as a result of the Turner River/Deep Lake Strand, Loop Road/Paces Dike, and possibly the Bear Island Road restoration projects. (See the description of the impact for the proposed action.)

Impacts from rehabilitating abandoned fill sites and roads would also be the same as under the proposed action (more natural surface flows would be restored to about 100 acres).

More extensive visitor-related developments would displace more surface flow under this alternative than under the status quo alternative or the proposed action. About 45 acres of wetlands would be filled. Of the total, 32 acres of filled land would be required to widen and improve drainage under the Loop Road, and another 5 acres would be filled to provide recreation access off I-75 in the northern portion of the Turner River unit. Assuming proper design, these facilities would not cause a major impoundment or diversion of surface flow beyond the filled area.

Geophysical activities could occur anywhere in the preserve under alternative A, and anticipated activities would affect an estimated 433 additional miles (524 acres), some of which would be in wetlands subject to periodic surface flow. Provisions of the minerals management plan would seek to prevent or lessen impacts associated with vehicle use for geophysical activities and with sediment mounds created during shot-hole drilling activities, which could alter water flows. Limestone caprock could collapse around some drill holes, resulting in sinkhole formation, ponding, and vegetation changes (e.g., invasion by cattails); these impacts would be difficult to mitigate. Fractured caprock could also alter groundwater flows.

Past and present drilling and production activities have displaced 259 acres, and potential future development could displace an additional 215 acres, including 40 miles of access roads and pipelines. Under this alternative drilling and production activities could occur anywhere in the preserve, including the extensive wet areas in the Stairsteps unit. If oil and gas develement occurred south of US 41, surface water flows could be disrupted, causing adverse effects on the Ten Thousand Islands estuary in Everglades National Park. Hydrological relationships in the Stairsteps and Loop units and the adjoining area of Everglades are highly sensitive, and the extent of impacts would depend on the location and scale of the potential petroleum development. Adverse hydrological effects, such as ponding, altered flow velocity and patterns, and water temperature changes, could occur in an area 500 feet on any side of developments, as discussed in appendix B.

Conclusion. Alternative A would result in a net increase of over 38,000 acres restored to more natural surface flows. About 45 acres of surface flow would be displaced by new NPS developments. Up to 215 acres could be displaced by future oil and gas operations. Effects from drilling and production could occur anywhere in the preserve; however, the area of influence for oil and gas activities would be limited to 10 percent of the preserve at any one time. Therefore, impacts on water flows due to oil and gas activities are expected to be lower under this alternative than the status quo alternative.

IMPACTS ON WATER QUALITY

Analysis. Impacts on water quality would be similar to those described for the status quo alternative with one exception resulting from minerals management. In the Bear Island unit, plans of operations would be reviewed on a case-by-base basis, and development could occur off existing pads and roads. Consequently, potential adverse effects on water quality would increase due to the greater extent of oil and gas development in this unit.

Under alternative A oil and gas activity could occur south of US 41 in the Loop and Stairsteps units. Due to the proximity of Everglades National Park and the concentration of surface water flows, there would be a potential for future petroleum developments accidentally polluting the waters of Everglades National Park. Even though the risks of a major accident are believed to be low, such an event would violate one of the purposes for which Big Cypress was established – to protect the water quality in Everglades.

Anticipated future geophysical activities, which could be proposed anywhere in the preserve, would affect an additional 433 miles (524 acres). Unless stipulations of the minerals management plan were complied with, impacts associated with turbidity from drilling and vehicle ruts, changes in pH due to limestone cuttings and bentonite, and fluids discharged from vehicles and equipment could all affect water quality within the preserve. Groundwater disruption from drilling shot holes and explosions could affect water quality, as described under the impacts of the proposed action.

Past drilling and production activities have displaced 259 acres, and the potential future development would displace an estimated 215 additional acres. Adverse water quality impacts, such as turbidity, sedimentation, spills of contaminants (such as production fluids, crude oil, and brines), water use (related to aquifer contamination), and construction wastes, could occur in a 1,000-foot area on any side of developments, as discussed in appendix B.

Conclusion. Water quality throughout Big Cypress National Preserve would generally be protected. Any accidental petroleum spill south of US 41 could adversely affect water quality in Everglades National Park. Overall impacts to water quality from oil and gas activities are expected to be lower under this alternative than under the status quo alternative.

IMPACTS ON CYPRESS STRANDS / MIXED-HARDWOOD SWAMPS / SLOUGHS AND CYPRESS DOMES

Analysis. The greatest impact of alternative A, like the proposed action and alternative B, would be the restoration of more natural hydroperiods to an estimated 11,000 acres of strand / swamp / slough and cypress dome communities as a result of the Turner River/Deep Lake Strand and Loop Road hydrological restoration projects.

An estimated net total of 37 acres (20 miles) of strand / swamp / slough vegetation would recover because of ORV trail management. However, within this net total, 18 acres (10 miles) of partially recovered ORV trails in the Loop unit would be reopened to use, which would result in the removal of new herbaceous and shrub plants along the trails.

Impacts from fire and exotic plant management would be the same as those described under the proposed action.

Effects of oil and gas geophysical, drilling, and production activities under alternative A would probably be similar to those described under the the status quo alternative.

NPS developments under alternative A would occupy a total of 17 acres of strand / swamp / slough and dome vegetation. Of this total, 15 acres would be affected by widening the Loop Road.

Conclusion. Alternative A would support the long-term health and maintenance of cypress strand / mixed-hardwood swamp / slough and cypress dome communities in Big Cypress. However, some direct or indirect impacts from oil and gas activity could occur.

IMPACTS ON MARSHES

Analysis. Impacts on marshes would be similar to these described under the proposed action, with the following exceptions.

There would be an increased risk of accidental damage to marshes in the Stairsteps unit from oil and gas activity. Even though petroleum development would avoid marshes if at all possible, an oil field could be developed south of US 41 immediately adjacent to marsh vegetation. Chances of a spill or leak are low (see impact discussion for the proposed action).

Approximately 3 acres of marsh would be occupied by NPS development. Two acres in East Hinson Marsh would be lost as a result of widening Perocchi Grade and Bear Island Road.

Conclusion. Alternative A would support the health and maintenance of marshes, but there would be a greater potential risk of damage from oil and gas activity.

IMPACTS ON MANGROVE FORESTS

Impacts on mangroves would be similar to those described under the proposed action.

IMPACTS ON OLD-GROWTH PINELANDS

Impacts on old-growth pinelands under alternative A would be the same as those described under the proposed action except that an additional 0.5 acre would be lost as a result of improvements to the Loop Road.

IMPACTS ON HARDWOOD HAMMOCKS

Analysis. Impacts to hardwood hammocks would be similar to those described under the proposed action with the following exceptions.

A total of 5 acres of hardwood hammock vegetation would be removed for NPS development (rather than 1 acre under the proposed action). Two acres would be removed for the Bear Island Road / Perocchi Grade improvement and 1 acre for improvements to the Loop Road.

The effects on hardwood hammocks from ORV management would be the same as described under the proposed action except that an additional 2 acres of formerly disturbed hammock vegetation would be removed in the Loop unit as a result of reopening ORV trails.

Proposed controls on geophysical activities to locate oil and gas reserves would protect hardwood hammocks from vehicle access to prevent wheel ruts and vegetation damage, in accordance with the stipulations in a minerals management plan. Drilling and production activities would avoid these communities, if at all possible, so no direct impacts would be expected. Also, the topographic elevation of hammocks would prevent major impacts due to spills or leaks.

Conclusion. Alternative A would generally protect hardwood hammocks in the preserve. The loss of 5.5 acres of hammock vegetation would be minor.

IMPACTS ON FLORIDA PANTHERS

Analysis. Under alternative A direct mortality to Florida panthers from illegal shooting would be reduced somewhat compared to the current situation, primarily because the total number of hunters would be reduced and enforcement improved. The threat of panther deaths or injury from automobile accidents (currently one accident every four or more years on US 41) would possibly be improved because of NPS cooperation with state agencies to enforce speed limits. The potential for accidents on Florida 84 would be reduced with the construction of I-75. The threat of accidental panther deaths due to research activities would continue, but the risk would decrease over the current rate (one death every four years) because of technical advances in tranquilizing procedures.

Alternative A would probably result in a moderate increase in the prey base for the Florida panther because of expanded prescribed burning and, to a much lesser extent, exotic plant control. Hunting pressure on prey populations, particularly deer and wild hogs, would be reduced by establishing a full-season quota preservewide and by restricting the use of dogs in the Deep Lake and Corn Dance units. The potential prey base for panthers in the Loop unit could be reduced over present densities by allowing hunting dogs and ORVs to be used for hunting.

Potentially beneficial and adverse effects related to human disturbance in Florida panther habitat would be mixed. Limiting the total number of hunters during the general gun season and designating ORV access points would reduce disturbance throughout the preserve. Establishing designated ORV trails would reduce disturbances in the Bear Island unit. However, upgrading the Perocchi Grade / Bear Island Road to allow street-legal vehicle access could alter panther movements in the unit. To mitigate these effects, the road would be closed from sunset to sunrise, the time of most panther activity. In the Deep Lake unit providing an ORV-accessible backcountry campground would increase human presence during the night, and panthers would probably avoid the vicinity of the campground in the central portion of the unit. Panther habitat could also be adversely affected in this unit by continued dispersed ORV access and backcountry camping. In the Corn Dance unit, a known panther area, dispersed ORV access and unrestricted backcountry camping could continue to affect panther activities. The northwestern portion of the Turner River unit, an area known to be used by panthers, could receive heavy ORV use because of recreation access off I-75. Dispersed ORV access and unrestricted backcountry camping could also be adverse factors in future panther occupation of the Turner River, Loop, and Stairsteps units. Restricting overnight backcountry camping to designated sites in the Bear Island, Deep Lake, and Corn Dance units would help control possible adverse effects on panther movement.

Rerouting the Florida National Scenic Trail to Ochopee would not affect known panther areas but would increase overnight human presence in potential panther habitat. Frontcountry visitor use and administrative facilities would be within existing developed areas and corridors, which would be unlikely to further affect panther behavior.

The Loop unit is not currently known to contain a resident panther population, even though the unit contains apparently good panther habitat. However, the quality of habitat in the Loop unit for future panther occupation would probably decline under alternative A because ORVs and hunting dogs could be used.

Disturbance and occupancy of panther habitat by oil and gas operations would be controlled under this alternative the same as under the proposed action. Although vegetation types important to the panther (hammocks, strands, and swamps) would be avoided if possible, petroleum development could affect panther movements and their use of adjacent lands.

Conclusion. Alternative A would probably reduce direct mortality risks to the Florida panther, but it would tend to concentrate human activity in known or potential panther habitat.

IMPACTS ON CAPE SABLE SEASIDE SPARROWS

Impacts on the Cape Sable seaside sparrow would be similar to those described under the proposed action, except there would be a risk of future displacement or abandonment of a portion of habitat due to oil and gas geophysical, exploratory drilling, and production activities.

IMPACTS ON RED-COCKADED WOODPECKERS

Impacts on red-cockaded woodpeckers would be similar to those described under the proposed action, except that there would be a risk of future displacement or abandonment of a portion of habitat due to oil and gas geophysical, exploratory drilling, and production activities.

IMPACTS ON BALD EAGLES

Impacts on bald eagles would be similar to those described under the proposed action.

IMPACTS ON *LIGUUS* TREE SNAILS

Impacts on *Liguus* tree snails would be similar to those described under the proposed action. Vehicular access for geophysical activities would be prohibited in the tree snails' hammock environment. Drilling and production activities in hammocks would be avoided, if possible, so the likelihood of direct impacts on tree snails would be low.

IMPACTS ON WHITE-TAILED DEER AND FERAL HOGS

Analysis. Increased prescribed burning, exotic plant control, hydrological management, and grazing management would have impacts on white-tailed deer and feral hogs similar to those described under the proposed action. These actions would generally improve deer and hog habitat in the preserve.

Frontcountry NPS developed areas would total 58 additional acres. For the most part, the additions would be adjacent to existing development and would not significantly reduce deer and hog habitat. The proposed ORV staging area at Cypress Lane would be the largest single new development, and although the facility alone would not be likely to reduce deer and hog habitat, increased ORV use associated with the staging area could affect habitat quality. (This is further discussed below, along with other effects of ORV use.) Backcountry developments under alternative A and their effect would be similar to those of the proposed action.

Oil and gas development could affect an additional 215 acres of deer and hog habitat. Assuming that important resource types would be avoided if possible and that most petroleum development would be restricted to second-growth pinelands and prairies, this habitat loss would probably equate to less than that required to support one deer. The effects of displacement would be localized. In areas within several hundred yards of pad operations, deer and particularly hog densities could be reduced because of noise and other disturbances. As described under the proposed action, the animals would probably habituate to the stationary, long-term disturbances associated with oil and gas operations. Also as described under the proposed action, the effect of geophysical activity would probably cause temporary, localized displacement of deer and hogs.

Potential deer and hog habitat would be reduced compared to current conditions because of ORV trail use. The reduction would be less than that under the proposed action and would probably not have extensive effects on available deer and hog habitat. The potential disturbance effects on deer and hogs from ORV use would probably be reduced over existing conditions because a full-season hunter quota would restrict this activity. An exception could occur in the northern portion of the Turner River unit where an ORV access point and staging area off I-75 at Cypress Lane could concentrate both recreational and hunting-related ORV use. If this happened, deer and hogs in this part of the preserve could be subject to more disturbance during the hunting season. Concentrated ORV use and hunting could result in increased wildlife movements and possibly physiological stresses, which could adversely affect reproduction, health, and condition of the animals (see the impact discussion for the proposed action).

Deer and hog mortalities due to legal hunting would be relatively unchanged from the current condition, averaging approximately 140 deer and 130 hogs per year. However, with a shorter season (40 days instead of 60) and increased monitoring of hunting activity, game law enforcement would improve, and illegal harvests (estimated to be 7 percent of the annual deer population) would possibly decrease. Eliminating dogs for deer and hog hunting in the Deep Lake and Corn Dance units could contribute to greater deer and hog densities in these areas because of reduced movement (see the impact discussion under the proposed action). In areas where hogs are no longer considered necessary as panther prey, they would be reduced or eliminated.

Conclusion. Deer and hog habitat would be improved and population densities increased over the current condition in much of the preserve.

IMPACTS ON AIR QUALITY

The impact on air quality would be similar to that described under the proposed action and the status quo alternative. Like the proposed action, oil and gas development would be limited in that no more than 10 percent of the preserve could be affected by such activities at any one time; however, like the status quo alternative, development could occur anywhere within the preserve.

IMPACTS ON CULTURAL RESOURCES

Analysis. Cultural sites would receive more protection in the Bear Island unit because ORV trails would be designated and would avoid known cultural sites where possible, thus reducing potential adverse effects from ORV use. In all remaining units, where ORV use would be dispersed, selected closures would occur in limited areas to help protect cultural sites.

Because a larger portion of the preserve would be managed under the dispersed use ORV concept, alternative A would afford less protection for cultural sites than would the proposed action. (Owners of improved properties on which cultural resources are located would still be allowed access to their properties as long as cultural sites were not adversely affected.)

As described under the proposed action, the expansion of the prescribed fire program and the exotic plant and animal program under this alternative would increase the level of protection for cultural sites.

The level of protection efforts would depend on available funding and would be distributed so that only those sites on or potentially eligible for listing on the National Register of Historic Places would be actively protected. The remaining sites would be passively managed and would receive less protection than under the proposed action.

Undesignated backcountry camping in five units of the preserve would increase the potential for damage to cultural sites. More protection would be provided for sites in the Bear Island unit because backcountry campsites would be designated, thus known cultural sites would be avoided.

Impacts on cultural resources as a result of oil and gas activities under alternative A would be negligible.

Conclusion. Because a significant portion of the total number of cultural sites would be passively managed, alternative A would provide less protection for cultural sites than would the proposed action. Maximum protection and management would be concentrated on sites that are on or are potentially eligible for listing on the National Register of Historic Places. Compared to the proposed action, cultural sites would be subject to greater potential damage because more of the preserve would be managed for dispersed ORV use.

IMPACTS ON HUNTERS AND HUNTING

Analysis. Hunters' ORV access under alternative A would be less restricted than under the proposed action because the Bear Island unit would be the only unit in the preserve to be managed as a designated trail system area. Hunting would be dispersed through all units except for Bear Island, where hunting along or near designated trail routes would be expected to increase. Upgrading the Perocchi Grade / Bear Island Road to allow street-legal vehicles could increase both hunter and tourist traffic through Bear Island, resulting in user conflicts and crowding in general.

A new ORV access on I-75 at Cypress Lane would probably lead to substantially more hunting in the northern portion of the preserve. This new ORV entrance, with its direct and high-speed connection to both Florida coasts, could attract hunters who now use access points along US 41, as well as new hunters who have traditionally hunted outside the preserve.

The hunter quota for a 40-day general gun season would probably be in the range of 4,000 permits. Some hunters would feel there were too many regulations. However, hunters would have the opportunity to hunt deer and hogs with dogs in the Loop, Stairsteps, and Turner River units. Hunting deer and hogs with dogs would be prohibited in the Bear Island, Deep Lake, and Corn Dance units.

Abandoned oil and gas pads in the Bear Island unit that are currently used for camping sites would no longer be available for such use if they were reoccupied by oil and gas

s. More oil and gas development would create visual and noise intrusions in the al setting and would adversely affect the experience of many hunters.

Conclusion. Hunters in general would find more restrictions under alternative A than existing conditions because a full-season quota permit system would be established. However, hunting would be less restricted under this alternative than under the proposed action.

IMPACTS ON ORV USERS

Analysis. Recreational ORV users would have access to the entire preserve because all units except Bear Island would be managed for dispersed use. ORV users in most units would notice little change from existing conditions, although use of some areas could be limited in order to protect important resource values. The Loop unit would be reopened to ORV use, providing an additional 30 miles of trail. As compared to existing conditions, there would be an overall net reduction in ORV trail miles of about 10 percent.

The proposed ORV access point on I-75 at Cypress Lane would provide a direct and convenient route for users from Florida's east and west coasts. This new access point could greatly increase ORV use in the northern portion of the preserve. Potential adverse effects could include crowding and user group conflicts.

ORV users would be able to enter the preserve only at 51 designated access points. Many ORV users would feel inconvenienced because they can now enter the preserve anywhere along the boundary.

The proposed upgrading of 19 selected parking and access areas would provide visitors with a safer and more convenient means of using the preserve.

Instituting a new orientation and interpretive program would inform ORV users about how to use the preserve while protecting its valuable resources.

Some ORV trails could be displaced by oil and gas access roads. Access roads and megapads could also act as barriers to ORV travel if such vehicles were allowed to cross access roads only at specified locations.

Because both ORV use and oil and gas development could still occur under alternative A, there could be conflicts between the two uses.

Conclusion. The overall experience for ORV users would be improved throughout the preserve, including the Loop unit. Designating trails in the Bear Island unit and rerouting trails in other areas would result in a 10 percent net reduction in trail miles. Upgraded parking and access facilities would improve the overall experience for many ORV users.

IMPACTS ON OTHER VISITORS

Analysis. Conflicts between ORV users and hikers along the Florida National Scenic Trail could increase along the northern portion of the trail because more ORV users would have access to this portion of the preserve from I-75.

Tourists, wildlife observers, and hikers would expect to see fewer ORVs near the East Hinson Marsh interpretive area. Designating ORV trails in the Bear Island unit would reduce the visual and noise impacts of ORVs in and adjacent to the marsh. Upgrading Bear Island Road / Perocchi Grade to make it accessible to street-legal vehicles would somewhat increase the noise and visual intrusions in the Bear Island unit but would provide increased sightseeing and interpretive opportunities for general visitors.

New conflicts could result between ORV users and other types of visitors in the Loop unit because it would be reopened to ORVs.

Shortening the general gun hunting season would have the same effect as that described under the proposed action.

Impacts associated with the implementation of the interpretive program, the upgrading of campgrounds, and the increased prescribed burn program would be the same as those described for the proposed action.

Impacts of oil and gas development would be the same as those described for the status quo alternative. However, only 10 percent of the preserve could be subject to the effects of development at any one time, thus reducing the potential for impact compared to the status quo alternative.

Conclusion. Alternative A would provide the broadest interpretive and recreational opportunities for the general public. Potential conflicts between ORV users and other visitors would continue, and new conflicts between hikers and ORV users could occur in the Loop unit, which would be reopened to ORV use.

IMPACTS ON NONFEDERAL PROPERTY OWNERS

Analysis. Approximately 115 inholders in all units except Bear Island would notice little change from existing conditions in terms of unrestricted ORV use. Localized and temporary trail closures to correct resource problems would cause a few inholders to occasionally alter their traditional routes to and from their properties; otherwise, inholders would continue to have almost complete freedom of movement by ORV.

Two backcountry inholders in the Bear Island unit would be guaranteed access to their properties on designated trails. However, these backcountry property owners, as well as other ORV users, would be confined to the unit's designated trail system, and thus their freedom of movement would be somewhat curtailed.

With the completion of I-75 and the development of an ORV access point at Cypress Lane, a significant number of ORV users could be funneled into this immediate area.

User conflicts between inholders and other ORV users in the northern part of the Turner River unit would probably increase.

Reducing the level of hunting activity, when combined with the potential for reduced traffic volumes on US 41 following completion of I-75, could cause some income loss for commercial inholders along US 41.

Establishing a full-season hunter quota would not guarantee inholders an opportunity to hunt during the general gun season. Hunting deer with dogs would be restricted in the Deep Lake, Corn Dance, and Bear Island units, but it would be allowed in the other units, including in the Loop unit for the first time in 10 years. The effect of these hunting proposals could be a decrease in hunting interest for inholders and possibly a decrease in property values.

Most of the backcountry inholders would be in units where camping would be unrestricted, and an increase in campers could result in more conflicts between backcountry campers and inholders. Upgrading NPS camping facilities would have a limited effect on commercial camping operations as described under the proposed action.

Upgrading the Loop Road and encouraging visitor use, providing additional ranger stations in both Bear Island and along the Loop Road near Pinecrest, and expanding the prescribed fire management program, would have the same impacts as described under the proposed action.

The impacts on state lands would be the same as those described for the proposed plan.

The impacts on inholders from oil and gas development could be slightly less than under the status quo alternative because such development would be allowed to affect a maximum of 10 percent of the preserve at any one time.

Conclusion. Inholders would still have broad ORV access throughout the preserve except for the Bear Island unit. Inholders could be adversely affected by more ORV users along I-75 and by more restrictive hunting regulations, which could adversely affect the personal and monetary values of inholdings.

IMPACTS ON MINERAL INTERESTS

Analysis. Alternative A would theoretically allow oil and gas development to occur anywhere in the preserve, like the status quo alternative. However, only 10 percent of the preserve would be subject to oil and gas development at any one time, and abandoned roads and pads would have to be reclaimed before new projects would be allowed.

Conclusion. Mineral interests would be negatively affected if proposed oil and gas development influenced more than 10 percent of the preserve lands at any one time. Approval of plans of operations could be delayed until other oil and gas sites had been reclaimed.

ALTERNATIVE B

IMPACTS ON SURFACE WATER FLOWS

Analysis. Under alternative B, as with the proposed plan and alternative A, more natural surface flows and hydroperiods would be restored over a 38,000-acre area because of the Turner River/Deep Lake Strand, the Loop Road/Paces Dike, and possibly the Bear Island Road restoration projects. See the impact discussion for the proposed action for further details.

Impacts from the rehabilitation of abandoned fill sites and roads would also be the same as described under the proposed action (more natural surface flows would be restored to about 100 acres).

Alternative B would differ from the other alternatives in that there would be a net reduction (rather than increase) in surface flow displacement on about 93 acres as a result of NPS-related developments. This would be due to the removal of NPS facilities in the Ochopee area and site restoration. About 6 acres would be displaced at other locations.

Geophysical activities to locate oil and gas reserves would be permitted only in those specific zones where drilling and production operations would be allowed. Disruption of water flows under this alternative are expected to be minimal.

To date drilling and production activities have displaced 259 acres, and potential future development would displace an estimated 39 additional acres. Under this alternative drilling and production activities would be very limited, occurring only in the vicinity of the Raccoon Point field in the northern portion of the Turner River unit and on existing roads and pads in the Bear Island unit. Adverse hydrological effects, such as ponding, altered flow velocity and patterns, and water temperature changes, could occur in an area 500 feet on any side of developments, as discussed in appendix B. However, because the area of influence would be relatively small, this alternative would have the lowest impacts to water flows of any alternative.

Conclusion. Surface water flows would be generally improved under alternative B with over 38,000 acres restored to more natural sheet flows. NPS-related developments would displace about 93 acres. Up to 39 acres could be displaced by oil and gas drilling and production activities. Overall impacts resulting from oil and gas activities would be less under this alternative that any other alternative.

IMPACTS ON WATER QUALITY

Analysis. Compared to the proposed action and the other alternatives, alternative B would pose the least threat to water quality from petroleum operations. Restrictions on oil and gas activity would confine potential pollution problems to the Bear Island unit and the northern portion of the Turner River and Corn Dance units, with virtually no threat to water entering Everglades National Park. The risks of accidental spills or leaks would increase from the current rate but would be less than under the proposed action or any of the alternatives.

Geophysical activities would be permitted only in those specific zones where drilling and production operations would be allowed. Degradation of water quality under this alternative would be expected to be minimal.

Past drilling and production activities have displaced 259 acres, and potential future development would displaced an estimated 39 additional acres. Adverse water quality impacts, such as turbidity, sedimentation, spills of contaminants (such as production fluids, crude oil, and brines), water use (related to aquifer contamination), and construction wastes, could occur in a 1,000-foot area on any side of developments, as discussed in appendix B. Because the total area subject to effects from oil and gas activities would be relatively small, this alternative would have the lowest impacts to water quality of any alternative.

Conclusion. Alternative B would protect water quality in the preserve and in Everglades National Park. Overall impacts on water quality were be the least of any alternative.

IMPACTS ON CYPRESS STRANDS / MIXED-HARDWOOD SWAMPS / SLOUGHS AND CYPRESS DOMES

Analysis. Under alternative B, as described under the proposed action and alternative A, more natural hydroperiods would be restored to an estimated 11,000 acres of strand / swamp / slough and cypress dome communities as a result of the Turner River / Deep Lake Strand and the Loop Road hydrological restoration projects.

An estimated 70 acres (40 miles) total of strand / swamp / slough vegetation would recover due to ORV trail management. Approximately 47 acres of this total would result from the closure of the Bear Island, Deep Lake, and Corn Dance units to ORV use.

Impacts from fire and exotic plant management would be the same as described under the proposed action.

Restrictions on oil and gas development would result in a very low risk of accidental contamination of strands / swamps / sloughs or cypress domes. Potential accidents would be confined to the Bear Island unit and the northern portion of the Turner River and Corn Dance units. These communities would be avoided for drilling and production under this alternative, and any geophysical operations crossing them would be subject to the stipulations in a minerals management plan.

New NPS developments under alternative B would occupy only 0.5 acre of cypress strand / mixed-hardwood swamp / slough vegetation.

Conclusion. Alternative B would support the long-term health and maintenance of cypress strand / mixed-hardwood swamp / slough and cypress dome communities.

IMPACTS ON MARSHES

Analysis. Impacts on marshes would be similar to those described under the proposed action with the following exceptions. Closing the Bear Island, Deep Lake, and Corn

Dance units to ORV use would permit approximately 50 acres of marsh vegetation to recover. Restricting ORV use to only designated trails in the Turner River and Stairsteps units would allow at least 200 acres of marsh to recover. There would be virtually no threat to the extensive marshes south of US 41 from oil and gas activity.

Conclusion. Alternative B would support the health and maintenance of marshes and provide for the greatest recovery from ORV use.

IMPACTS ON MANGROVE FORESTS

Impacts on mangrove forests would be similar to those described for the proposed action except there would be virtually no threat from oil and gas activity.

IMPACTS ON OLD-GROWTH PINELANDS

Analysis. Impacts on old-growth pinelands would be similar to those described under the proposed action except that about 29 acres (16 miles) of existing ORV trails through old-growth pinelands would be allowed to recover by closing the Bear Island, Deep Lake, and Corn Dance units to ORV use and restricting ORVs to designated trails in the Stairsteps and Turner River units.

Conclusion. Alternative B would perpetuate existing old-growth pinelands.

IMPACTS ON HARDWOOD HAMMOCKS

Analysis. Impacts would be the same as those described under the proposed action except for the effects of ORV management. Closing the Bear Island, Deep Lake, and Corn Dance units to ORV use and limiting ORVs to designated trails in the Turner River and Stairsteps units would allow the recovery of a total of 12 acres of hardwood hammock vegetation (compared to 8 acres under the proposed action).

Conclusion. Alternative B would protect hardwood hammocks in the preserve, and it would allow the greatest recovery of hammock vegetation from ORV use.

IMPACTS ON FLORIDA PANTHERS

Analysis. Alternative B would substantially increase the protection of Florida panthers and their habitat within the preserve. Direct mortality from illegal shooting would be reduced over the current rate (one death every 1.3 years) by excluding hunting and ORV use in units with known resident panther populations. The probability of contact between panthers and armed individuals would be significantly reduced, and the enforcement of poaching regulations would be greatly simplified. Direct panther mortality from traffic accidents on US 41 would possibly be reduced by improved cooperation for traffic enforcement between state agencies and the National Park Service (the current rate is one accident every four or more years). Panther fatalities on Florida 84 would be reduced because of the construction of I-75 (an action independent of this plan).

Accidental deaths due to research activities would not be affected but would probably decrease because of improved immobilizing drugs and more experienced researchers.

Perhaps the most important factor in improving panther protection under alternative B would be the large-scale reduction in human disturbance in units with known resident panther populations. Eliminating hunting and ORV use and rigorously limiting oil and gas operations in the Bear Island, Deep Lake, and Corn Dance units would remove or greatly restrict activities that could adversely influence panther movement and recruitment (see impact discussion under the proposed action). Panther habitat quality would probably be significantly enhanced in these units. Backcountry camping in all units would be limited to designated sites, thus further controlling human presence in known or potential panther habitat. Eliminating the use of dogs for deer and hog hunting, and restricting ORV use to designated trails in the Turner River and Stairsteps units, would reduce the disturbance potential preservewide.

Under alternative B densities of white-tailed deer, feral hogs, and other panther prey species are expected to increase above current conditions as a result of expanded prescribed fire programs, control or elimination of exotic plants, significantly reduced hunting harvests, and less human activity in the backcountry.

Although the panther population could benefit from an increase in prey species, there would be a remote possibility that the preserve could become overpopulated by such species. If predation from panthers and other predators, or other environmental factors, did not control the numbers of deer and hogs, and if prey densities increased beyond the carrying capacity of the environment, then the prey populations could become nutritionally stressed and susceptible to widespread die-off as a result of epidemic diseases, parasitic infestation, or starvation. Such a crash in prey populations could adversely affect panther survival. There are no recorded incidents of population collapses for Big Cypress, but there was such a die-off among deer in 1982 in conservation area 3A just east of the preserve. Artificially high water levels in the impoundment that year confined deer to tree islands and heads, concentrating the herd and limiting available food (Langenau et al. 1984). The die-off was a result of water management actions and not due to natural conditions. It is unlikely that deer populations in Big Cypress would undergo such a drastic population crash.

Much of the preserve would be closed to oil and gas development under alternative B. A maximum of 39 acres could be affected by development related to oil and gas exploration and production. Areas believed to be prime panther habitat would be avoided.

Conclusion. Alternative B would probably substantially increase the protection of the Florida panther and its habitat. Adverse effects on panthers would be the least of any alternative.

IMPACTS ON CAPE SABLE SEASIDE SPARROWS

Impacts on Cape Sable seaside sparrows would be similar to those described under the proposed action except there would be virtually no threat from oil and gas activity.

IMPACTS ON RED-COCKADED WOODPECKERS

Impacts on red-cockaded woodpeckers would be similar to those described under the proposed action.

IMPACTS ON BALD EAGLES

There would be no effect on bald eagles under alternative B.

IMPACTS ON *LIGUUS* TREE SNAILS

Impacts on *Liguus* tree snails would be similar to those described under the proposed action.

IMPACTS ON WHITE-TAILED DEER AND FERAL HOGS

Analysis. As described under the proposed action, increased prescribed burning, exotic plant control, and hydrological management would generally improve deer and hog habitat in the preserve.

NPS development under alternative B would have very little effect on deer and hog habitat.

Oil and gas operations would be greatly limited and would be confined to second-growth pinelands or prairies in portions of the Sunniland trend in the Turner River and Corn Dance units; consequently, there would be very little effect on white-tailed deer and hog populations. Some animals could be displaced in the vicinity of pads.

ORV use would be restricted to designated trails in the Turner River and Stairsteps units, and it would be prohibited elsewhere. In addition, hunting would be permitted only in the Turner River, Stairsteps, and Loop units. As a result, the Bear Island, Deep Lake, and Corn Dance units would effectively become sanctuaries for white-tailed deer and hogs, among other wildlife, and deer densities would be expected to increase, particularly during the hunting season when animals could come from adjoining units. There would be a concomitant reduction in reproduction rate and the average size of animals. Age distribution would be more even in the population, and the proportion of adult males would increase. There would be a remote possibility of a population crash from overpopulation, as described under "Impacts on Florida Panthers."

The total elimination of feral hogs as an exotic species would be attempted but would probably not be successful. In-migration of hogs from lands outside the preserve, as well as illegal releases of hogs within the preserve, would hamper elimination efforts. Without recreational hunting as a control tool, the reduction of hog populations would probably be costly and could have limited results, particularly in the Bear Island, Deep Lake, and Corn Dance units.

Conclusion. Habitat for white-tailed deer and feral hog populations would be improved over current conditions. Deer densities would increase. Feral hog populations would be reduced but would probably not be eliminated.

IMPACTS ON AIR QUALITY

Impacts on the preserve's air quality under alternative B are expected to be much lower than they would be under the other alternatives. Oil and gas developments would be restricted to the Bear Island unit and the northern portions of the Turner River and Corn Dance units. Impacts resulting from the prescribed fire management program would be temporary.

IMPACTS ON CULTURAL RESOURCES

Analysis. Cultural sites on or potentially eligible for listing on the National Register of Historic Places would be protected. The elimination of ORV use in four units and the designation of ORV trails and all backcountry camping sites would reduce vandalism and erosion problems. Sites would be unaffected by oil and gas activity. As described under the proposed action, the expanded prescribed fire and exotic plant and animal control programs would reduce potential site damage. Miccosukee and Seminole Indian cultural sites would not be affected.

Conclusion. Cultural sites would receive the highest level of protection of any alternative.

IMPACTS ON HUNTERS AND HUNTING

Analysis. Deer and hog hunting would be reduced under alternative B by about 80 percent. Dogs would no longer be allowed for deer and hog hunting in the preserve, and probably 50 percent of the hunters would have to hunt either outside the preserve or within the preserve but without dogs. Approximately 40 percent of Big Cypress (Bear Island, Corn Dance, and Deep Lake units) would be closed to hunting, so general hunting pressure in the other three units could increase. Allowing general gun hunting in only two units (Turner River and Stairsteps units) would further limit hunting opportunities. The Loop unit would likely increase in popularity as one of the state's few areas designated exclusively for primitive hunting (bows and muzzle-loaded guns). Quotas would be set for the bow and muzzle-loaded gun seasons as well as the general gun season. Only a few hundred permits would be issued.

Alternative B would prohibit surface occupancy for oil and gas development in all of the Loop, Stairsteps, and Deep Lake units; it would allow oil and gas activities only on existing roads and pads in the Bear Island unit; and it would allow activities only in specific areas in the northern Turner River and Corn Dance units. Oil and gas activities would have very little impact on hunters and hunting under this alternative except in the Bear Island unit, where the reuse of abandoned roads and pads could displace hunting, and in the northern Turner River unit, where ORV trails (used by hunters) could be displaced because of oil and gas access roads and pads. This effect could be mitigated by designating other corridors for ORV use.

Conclusion. Hunting under alternative B would be more restricted than under any other alternative. A significant number of hunters could decide to hunt in other areas of south Florida.

IMPACTS ON ORV USERS

Analysis. The mileage of trails available to ORV users would be reduced by 34 percent. Use would be restricted to designated trails in the Turner River and Stairsteps units; ORV use would be prohibited in all the other units. These restrictions would greatly limit the freedom of movement by ORV users.

Restrictions to limit the number of ORV permits to 1,500 would substantially reduce ORV use in the preserve over the long term. Limiting the number of ORV permits would likely mean that users would have to compete in a lottery or draw in order to obtain a permit, and no ORV users would be assured of getting a permit each year.

Compared to unrestricted ORV access at present, this alternative would allow access only at 22 entry points, which could occasionally result in congested conditions at these locations, even with a restricted number of users. However, the upgrading of 12 entry points to developed parking areas would improve visitor safety and provide safer access to and from the highway.

Tracked ORVs would be prohibited in the preserve under this alternative. This would affect approximately 114 owners of such vehicles who now use the preserve and approximately 350 owners of tractor-tired swamp buggies. Swamp buggies would either have to be adapted for balloon tires or used elsewhere.

In the northern portions of the Turner River and Corn Dance units, some ORV trails could be displaced by the development of oil and gas access roads. Access roads and megapads could also create detours for ORV users because they would be allowed to cross access roads only at specified locations.

Conclusion. Compared to the other three alternatives, alternative B would provide the most restrictive and regulated conditions for all ORV users. A significant portion of recreational ORV users would probably look for alternative areas outside the preserve.

IMPACTS ON OTHER VISITORS

Analysis. Prohibiting ORVs in the Corn Dance unit and restricting them to designated trails in the Turner River unit would mean that hikers on the Florida National Scenic Trail would have minimum contact with ORV users.

Tourists, wildlife observers, and hikers could enjoy the Bear Island, Deep Lake, and Corn Dance units without being affected by hunters or ORV users. Visitation to these units, however, would probably be low because of the difficulty of access by foot.

Shortening the general gun hunting season would have the same effects on general visitors as those described under the proposed action, as would campground improvements and the prescribed burn program.

The interpretive program would still give visitors the opportunity to learn about the preserve and its significance, but there would be fewer on-site interpretive wayside exhibits or interpretive trails, as compared to alternative A or the proposed action, so visitors would have fewer opportunities to learn about resources firsthand.

Limited oil and gas development would reduce the level and amount of potential conflicts between oil and gas production operators and general visitors.

Conclusion. Alternative B would provide the least amount of contact between the general public and hunters/ORV users, thus reducing the potential for conflicts. Most visitors would continue to have limited opportunities to experience the preserve firsthand.

IMPACTS ON NONFEDERAL PROPERTY OWNERS

Analysis. All residential and commercial frontcountry property owners (approximately 100) would continue to have access by street-legal vehicles to their properties. The effects on inholders would be more limiting than under the proposed action because inholders would be prohibited from using their ORVs in the Bear Island, Deep Lake, and Corn Dance units except for direct designated access to their properties. Approximately 46 inholders would be affected. Approximately 75 backcountry property owners in the Turner River and Stairsteps units would be guaranteed access to their properties and would also be able to use ORVs on designated trail systems in these units.

Closing four units to ORV use would provide most backcountry inholders with a "wilderness" type experience, with little potential for conflicts with other user groups. General ORV use could grow in the Turner River and Stairsteps units because they would be the only areas open to such use, increasing the potential for conflicts between ORV users and backcountry inholders.

With the prohibition of ORVs in four units of the preserve, Jetport lands would likely become a popular ORV use area. Jetport managers would probably have to deal with increased soil erosion, vegetation damage, and user conflicts due to increased use. Overuse of Jetport lands would also increase the potential for unauthorized ORV entry into the preserve and possible damage to preserve lands next to the Jetport.

The cumulative effect of prohibiting ORV use in four units and prohibiting hunting in three units (Bear Island, Deep Lake, and Corn Dance) would have a greater impact on commercial inholders than would the proposed action. The potential losses to commercial retail businesses could be greatest under this alternative as a result of the overall reduced level of recreational activity in the preserve.

Inholders in units where hunting was prohibited would no longer be able to hunt near their properties. For many, this would greatly diminish the personal as well as monetary value of their properties.

Conflicts between user groups would probably be minimized under this alternative because all campsites within the preserve would be designated and thus located at reasonable distances from inholders.

Impacts of the prescribed fire management program would be the same as those described under the proposed action.

Impacts on state inholdings would be the same as for the proposed action.

Oil and gas development under alternative B would be severely restricted, and impacts on inholders would be expected to be minimal. The area in the northern Turner River unit that would be open to regulated oil and gas development contains no private inholdings, so no impacts would occur there.

The associated impacts of oil- and gas-related traffic on frontcountry inholders and on Miccosukee and Seminole Indians would be the least of any alternative.

Since the Jetport would be one of the few areas open to oil and gas exploration, these lands could experience a great increase in production activity if commercial reserves were discovered. To minimize potential impacts on the adjacent preserve, the National Park Service would cooperate with the county to minimize conflicts.

Conclusion. ORV restrictions and hunting regulations under alternative B would affect inholders more than under any other alternative. Impacts on inholders as a result of oil and gas development would be the least of any alternative.

IMPACTS ON MINERAL INTERESTS

Analysis. The proposed minerals management actions under alternative B could have a substantial effect on mineral interests whose petroleum proposals exceeded the acceptable level of development (no more than 10 percent of the preserve could be affected at any one time by oil and gas development). The proposed action would also restrict development in certain management units, as described below:

> ***Bear Island unit*** – Future drilling and production activity in this unit would be restricted to existing roads and pads. An estimated 80 percent of the subsurface area in this unit, given current technology, could be accessed by directional drilling from existing roads and pads, and from areas outside the preserve boundaries. Geophysical activities to locate oil and gas reserves would only be permitted on existing roads and pads.
>
> ***Deep Lake, Turner River, and Corn Dance units*** – Geophysical, exploratory drilling, and production activities would not be permitted in the Deep Lake unit, only in a specified area with few important resource areas in the Turner River unit (see the Minerals Management map), and in the vicinity of the Raccoon Point field (per Exxon's 1981 *Master Plan of Oerations*) in the Corn Dance unit.
>
> ***Loop and Stairsteps units*** – No access for geophysical, exploratory drilling, or production activities would be allowed in these two units.

Potential impacts to mineral owners, lessees, and operators under this alternative are extremely difficult to assess because the National Park Service has little information regarding the oil and gas development intentions of these groups, and virtually all of the oil and gas rights are in nonfederal ownership. This alternative, however, would severely restrict mineral interests from accessing known or potential reserves of oil and gas. Only an estimated 10 percent of the preserve would be available for entry.

It is difficult to determine the cost of purchasing nonfederal oil and gas rights if the owners' access to them was denied because most areas off the Sunniland trend have unproved reserves of oil and gas. These off-trend areas include all of the Loop, Stairsteps, and Deep Lake units, and portions of the Bear Island, Turner River, and Corn Dance units – a total area encompassing 431,671 acres, or 75.1 percent of the preserve. Two other cost categories of oil and gas reserve exist: unproved wildcat reserves on the Sunniland trend, and proved reserves near producing fields on the trend. Specific value figures per acre for these categories have not been determined.

In addition to nonfederal oil and gas owners, lessees, and operators, parties with potential leases could also be affected, as could any companies involved with oil and gas development in the preserve.

This alternative would further restrict mineral interests by requiring that important resource areas be avoided wherever oil and gas drilling and production operations were permitted. Geophysical activities could be permitted only in areas open to drilling and production, in accordance with the stipulations of a minerals management plan. In general these restrictions could increase operating costs.

Alternative B was developed in order to present and analyze an alternative that would provide extensive protection of important resource areas and that would also ensure the continued protection of Everglades National Park. The National Park Service understands that the actions resulting from this alternative could result in the agency having to purchase the mineral rights from the owners. A final decision to close areas to mineral development would constitute a finding by the Park Service that these areas are "subject to, or threatened with, uses which are, or would be, detrimental to the purposes of the preserve" (PL 93-440). Pursuant to such a finding, the National Park Service would notify Congress of its intent to begin acquiring the affected mineral interests, and it would seek appropriations for the acquisition.

Conclusion. This alternative could significantly affect mineral interests throughout the preserve by denying owners and lessees the right to extract known or potential reserves of oil and gas. This alternative would moderately affect mineral interests in the Bear Island unit since 20 percent of subsurface areas could not be reached under the restrictions included in this alternative. Interests in the Turner River and Corn Dance units would be significantly affected because only small zones would be available for oil and gas activities. No access to the Deep Lake, Loop, or Stairsteps units for oil and gas activities would be permitted. Pursuant to a decision to close areas to mineral development because it would be detrimental to the purposes of the preserve, the National Park Service would seek appropriations from Congress to acquire these mineral rights.

CONSULTATION AND COORDINATION

SCOPING PROCESS

Meetings, public workshops, newsletters, and a pamphlet of alternatives were included in the scoping process for the Big Cypress general management plan. Their purpose was to identify all issues, alternatives, and impact topics that should be considered in planning and to keep the public informed throughout plan formulation.

On March 8, 1985, a press release announced the intention of the National Park Service to prepare a general management plan for Big Cypress National Preserve. The announcement described the purposes and strategies to be developed, and it announced four public workshops. On March 14, 1985, a notice of intent to do an environmental impact statement for the plan and to begin scoping for that process was issued in the *Federal Register*.

Public Workshops

Four public workshops were conducted as part of the scoping process during the week of March 18, 1985. At Naples, Florida, 30 people attended; at Everglades City, 50; at Homestead, 250; and at Hollywood, 50. At each workshop the team presented highlights of the legislation and the time table of events associated with the plan preparation (specifically noting the milestones where the public would be involved in the process). The public was invited to discuss their ideas and concerns about the issues. A summary of major public concerns follows:

> ***Public Involvement*** – A paramount concern was the lack of public notice given the four Big Cypress public scoping meetings. The press release was not adequately carried by regional or local newspapers, or radio or television stations. The lack of notification was interpreted by most in attendance as an attempt by the National Park Service to avoid public participation in order to suppress adverse criticism. It was suggested that many more people would have attended these four meetings with adequate notice. Interest in additional public meetings after the release of the draft plan was expressed.
>
> Several expressed a concern that user groups should work both with NPS managers and planners. It was suggested that a committee or board made up of representatives of various user groups be created to serve as a consultant to both NPS managers and planners. Local users felt that their extensive knowledge of the preserve should be actively sought and used during the planning process. A request was made to have the Park Service appoint someone to work with the public on a monthly basis.
>
> ***General management*** – A major concern expressed was that Big Cypress National Preserve will eventually be managed using the traditional philosophy associated with national parks and that regulations will in effect close the preserve to public use. It was recommended that a special set of regulations be developed for the preserve to ensure that it does not become a national park.

Many expressed a concern that the endangered Florida panther issue is being used as a ploy to eliminate hunting and ORVs from the preserve. Most hunters stated that deer hunting within the preserve has not been proved to be detrimental to the panther's survival. Several expressed an opinion that researchers, oil exploration and development, and Florida 84 (I-75) create more hazards for panthers than either hunting or ORVs. It was frequently suggested that the use of both ATVs and dogs be allowed to continue within the preserve. Several recommended that the Florida Game and Fresh Water Fish Commission have full responsibility for managing hunting and fishing within the preserve.

Almost everyone was concerned with regulations. It was frequently stated that Big Cypress National Preserve has too many regulations; the regulations are not readily accessible; and the regulations are not in a format that the general public can easily comprehend. Many strongly objected to the use of the *Federal Register* as the primary means of conveying information and regulations to the general public. Specific examples given of perceived over-regulation were the number of permits and licenses associated with hunting and ORV activities. Several commenters expressed frustration with confusing and often conflicting regulations of the various agencies with overlapping responsibilities within the preserve. Several also complained that new regulations are continually being developed to deny access to areas of traditional use within the preserve. Several exempt property owners complained that if ATVs and street-legal vehicles were banned, they would be denied access to their properties.

It was suggested that the NPS policy of burning abandoned backcountry camps on federally owned land is very harmful to hammock sites and associated old-growth trees. Many criticized the Park Service for not removing the debris after having burned these camps. Several exempt property owners complained that they are harassed by the Park Service to keep their properties neat and clean, and yet the Park Service has no policy for cleaning up debris after burning operations. Several criticized the Park Service for improper use of prescribed burns because they thought these burns did more harm to the vegetation and wildlife than either hunting or ORV activities.

Almost everyone agreed with the objective of eradicating melaleuca from the preserve.

Several speakers wanted to re-open the Stairsteps airboat trail along the boundary between Everglades National Park and Big Cypress National Preserve.

Several comments were critical of the Corps of Engineers and the South Florida Water Management District for improperly managing the water flow through the Big Cypress area.

Several people expressed strong displeasure with management decisions made by the NPS superintendent at Big Cypress National Preserve with regards to:

closing roads behind the Ochopee headquarters area to prohibit street-legal vehicle access

failing to adequately post new regulations failing to adequately inform the public of the March 18 – 22 meetings

implementing the 24-hour parking abandonment rule and the 30-day camping limit regulation

Minerals management – The most frequently expressed opinion regarding energy development and exploration in the preserve was that energy activities represent the single greatest threat to the preservation of the preserve's natural values. Many stated that they would prefer to see the National Park Service spend more time regulating the oil companies and less time regulating recreational activities within the preserve. It was stated that oil companies come into the preserve and develop access roads using established ORV trails. A major concern was that after these ORV trails are upgraded to roads, ORV use is then prohibited.

Another concern was that any permitting of oil and gas development excluded other user groups from those portions of the preserve. Several stated that oil companies were allowed to add fill within the preserve (as related to pad and road development), but exempt landowners were denied the same fill privileges when attempting to improve their properties.

Hunters' Workshop

At the invitation of the Everglades Conservation and Sportsman Club, an NPS regional representative and two members of the planning team met with representatives of several local hunting organizations in February 1986 to discuss issues associated with the protection of Florida panthers, hunting, and ORV use.

Newsletters

In the summer of 1985 a newsletter was sent to more than 900 names on the mailing list. This newsletter summarized the comments from the March public workshops, and it stated that the comments would be considered during the preparation of the alternatives.

In the fall of 1985 a second newsletter listed meetings that had been held the previous August between the planning team and the following federal, state, and local agencies to discuss the purpose, schedule, and issues associated with this general management plan effort:

Florida Governor's Office
Florida Department of Transportation
Florida Game and Fresh Water Fish Commission
Federal Highway Administration
Florida Department of Environmental Regulation
U.S. Fish and Wildlife Service
Florida Petroleum Council
Florida Department of Natural Resources
Florida Panther Technical Advisory Committee
Collier County Planning Division

The newsletter also informed the public that the team would be spending the next several months preparing a resource base inventory for the preserve. The 12 resources that would be included in this inventory were briefly described.

In the fall of 1986 a third newsletter/brochure presented a color-coded map of the preserve, identifying important resource areas and describing each. The brochure also presented a brief legislative background statement and a message from the regional director.

Alternatives Pamphlet

In January 1987 an *Alternatives* pamphlet was released to ask the public's opinion about the preliminary alternatives being considered. Five alternatives plus an existing conditions alternative were presented for each of four major use categories: hunting management, ORV management, visitor services, and minerals management. The public was asked to select a management preference for each use category. More than 7,300 people responded. The response was split almost evenly between those who wanted to maintain existing conditions and those who wanted the most restrictive alternative.

> For hunting, a slight majority (44 percent of those responding) favored the most restrictive option (Bear Island, Deep Lake, and the Corn Dance units would be permanently closed to hunting, with a 30-day general gun season for the Turner River and Stairsteps units). However, 39 percent of the respondents wanted to maintain existing hunting conditions (a 60-day general gun season in all units of the preserve).
>
> The ORV comments were similar to hunting. Of the total responses, 52 percent favored the most restrictive option (ORVs would be prohibited in the Bear Island, Deep Lake, Corn Dance, and Loop units). However, 39 percent wanted to maintain existing conditions (unrestricted ORV use preservewide).
>
> Opinions on visitor services were mixed, with 41 percent favoring the alternative with the most improvements of visitor services and the least restrictions on backcountry camping. The alternative allowing camping only at designated campsites was favored by 35 percent of the respondents, while 14 percent chose the moderate alternative.
>
> A slight majority of respondents (45 percent) favored more restrictions on oil and gas exploration and extraction in the preserve (no surface occupancy would be allowed in the Deep Lake, Turner River, Loop, Stairsteps, and portions of Corn Dance units). However, 38 percent favored allowing oil and gas exploration and extraction throughout the preserve.

Consultation with Agencies

In August 1985, as previously described, meetings were held with various federal, state, and local governments. The agencies were primarily interested in how the planning process would proceed, what the public response was to date, and how and when the

National Park Service wanted the agencies involved in the process. Agencies were also contacted for information on numerous occasions.

In August 1986 a week-long workshop was conducted with representatives from the National Park Service, the U.S. Fish and Wildlife Service, and the Florida Game and Fresh Water Fish Commission to discuss issues and alternatives associated with the protection of the Florida panther and the management of hunting and ORV use within the preserve.

Consultation with Native Americans

In accordance with the American Indian Religious Freedom Act of 1978, the National Park Service contacted the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida on July 2 and August 11, 1985, to arrange a meeting during the week of August 19, 1985. Representatives of the tribes declined to meet at that time.

Miccosukee and Seminole groups were included on the mailing list for receiving all pubic notices and documents during the planning process. Further expanded consultation with Miccosukee and Seminole groups is ongoing for the development of special regulations concerning native American rights of use and occupancy.

Consultation with the Collier Companies

The Collier companies, the major subsurface property owners in the preserve, have been developing a long-range plan for the management of their oil and gas resources. Over the course of the planning process, several informal meetings were held to discuss the interrelationship of their plan and the development of the general management plan.

ALTERNATIVES AND ISSUES CONSIDERED

After analyzing public comments on the *Alternatives* brochure, it was decided to develop only four alternatives for the draft plan and environmental impact statement. Fewer alternatives would provide more distinct options and eliminate the confusion associated with a range of subtle differences between alternatives. These alternatives, including existing conditions, were developed to represent a range of management and development options.

The issues addressed by the alternatives are summarized in the "Issues Addressed by the Plan" section at the beginning of this document. Almost all issues raised have been addressed. The impact topics considered are described in the beginning of the "Environmental Consequences" section.

ISSUES NOT FURTHER CONSIDERED

The following issues were not further considered in the *Draft General Management Plan / Draft Environmental Impact Statement* for the reasons stated below:

Trespass properties – The establishing legislation was specific about the eligibility of those inholdings within the preserve that would qualify as "improved properties" and therefore be exempt from acquisition. The legality of this definition was upheld in the courts, and those inholdings within the preserve that did not qualify for exempt status were declared trespass properties. Based on the legislation and the court ruling, the general management planning effort does not address this issue and assumes that all trespass properties will be removed from the preserve.

Wilderness – A 1980 *Wilderness Recommendation* found that none of the lands within Big Cypress National Preserve were suitable for wilderness at that time. The conclusions of that study are still valid, and no re-evaluation is necessary.
Everglades airboat trail – The decision to close the Everglades Airboat Trail was made by Everglades National Park. Since this trail is under the jurisdiction of Everglades National Park, the Big Cypress planning effort will not address this issue.

Steering committee – Some public comments recommended that a steering committee of representatives of various user groups be established to advise and assist in the planning effort. The National Park Service initiated a full public involvement effort, with workshops, newsletters, informal meetings, and an alternatives pamphlet. No final decision for creating a steering committee has been made.

I-75 (Alligator Alley) – A series of recommendations were made by the public regarding the construction of and access from I-75 (Alligator Alley), which crosses the northern portion of the preserve. Since the management and construction of I-75 is the responsibility of the Florida Department of Transportation and the Federal Highway Administration, the National Park Service has participated only in a review capacity for the I-75 issue. Although the proposed general management plan and alternatives may make recommendations that would directly affect the design, construction, and management of I-75 (such as no vehicle access to I-75 within the existing preserve boundary), the Park Service has no direct authority to implement such actions.

Daily preserve operations – The procedures for posting regulations and information, the temporary closure of roads, and those types of restrictions that are placed on campers are daily operational decisions made by the superintendent and are not within the purview of this planning process.

LIST OF AGENCIES AND ORGANIZATIONS TO WHOM COPIES OF THE STATEMENT ARE TO BE SENT OR DISTRIBUTED

Florida Congressional Delegation

U.S. House of Representatives
Charles Bennett
James Craig
Dante B. Fascell
Don Fuqua
Sam M. Gibbons
Porter Gross
Earl Hutto
Andrew Ireland
William Lehman
Tom Lewis
Daniel A. Mica
Bill McCollum
Bill Nelson
E. Clay Shaw
C. W. Young

U.S. Senate
Bob Graham
Connie Mack

Florida State Legislature

Florida House of Representatives
Bert Harris
Mary Ellen Hawkins
Tim Ireland
Ron Saunders
J. W. Stevens

Florida Senate
Fred Dudley
Larry H. Plummer

Federal Agencies

- Advisory Council on Historic Preservation
- Department of Agriculture
  - Forest Service
  - Soil Conservation Service
- Department of Commerce
  - National Marine Fisheries Service
  - National Oceanic and Atmospheric Administration
  - Office of Coastal Zone Management
- Department of Defense
  - Air Force
  - Army Corps of Engineers

- Department of Health and Human Services
  - Public Health Service
- Department of the Interior
  - Bureau of Indian Affairs
  - Fish and Wildlife Service
  - Geological Survey
  - Minerals Management Service
  - National Park Service
    - Biscayne National Park
    - Everglades National Park
    - Fort Jefferson National Monument
    - Southeastern Archeological Center
- Department of Justice
  - Federal Bureau of Investigation
- Department of Transportation
  - Coast Guard
- Environmental Protection Agency

Native American Tribes and Groups

- Miccosukee Tribe of Indians of Florida
- Traditional Miccosukees
- Independent Seminoles
- Seminole Tribe of Florida

State of Florida

- Office of the Governor
- Department of Administration
- Department of Agriculture
- Department of Commerce
- Department of Community Affairs
- Department of Education
- Department of Environmental Regulation
- Department of Natural Resources
- Department of State
- Department of Transportation
- Game and Fresh Water Fish Commission
- Regional Planning Councils
- Water Management Districts

County Governments

- Collier County
  - Manager
  - Commissioners
  - Planning Department

Dade County
- Manager
- Commissioners
- Department of Environmental Resources Management
- Parks and Recreation
- Planning Department
- Port Authority

Monroe County
- Manager
- Commissioners
- Planning Department

Organizations

Airboat Association of Florida
American All-Terrain Vehicle Association
American Hiking Association
Bahamas National Trust
Big Cypress Exempt Property Owners Association
Big Cypress Hunt Club
Boy Scouts of America
Broward County Audubon Society
Center for Urban Affairs and Policy
Coalition of Concerned Citizens for Big Cypress National Preserve
Collier County Audubon Society
Collier County 4-Wheel Drive Club
Collier County Historical Society
Collier County Nature Conservancy
Commercial Fishermen of the Everglades
Corkscrew Swamp Sanctuary
Corp-Church Latter-Day Saints
Dade County Farm Bureau
Diamond Back Airboats
Everglades Area Chamber of Commerce
Everglades Conservation & Sportsman Club, Inc.
Everglades Coordinating Council
Everglades Protection Association
Fish & Game Unlimited, Inc.
Florida Audubon Society
Florida Chapter of the Sierra Club
Florida Conservation Fund
Florida Defenders of the Environment, Inc.
Florida Hunting and Fishing Council, Inc.
Florida League of Anglers, Inc.
Florida Nature Conservancy
Florida Public Interest Research Group
Florida Sportsmen Council
Florida Trail Association, Inc.
Florida Wildlife Federation
Friends of the Everglades

Girl Scouts Council of Tropical Florida
Goldcoaster Mobile Home & RV Association
Great Expeditions
Greater Marathon Chamber of Commerce
Greater Miami Chamber of Commerce
Gum Slough Property Association
Isaak Walton League
Islamorada Chamber of Commerce, Inc.
Key West Chamber of Commerce
Key Largo Chamber of Commerce
Keyes Fishing Guides Association
Keys Conservation Coalition
Landowners Protection Association
League of Women Voters
Metropolitan Miami Fishing Tournament
Miami Group, Sierra Club
Naples Chamber of Commerce
National Audubon Society
National Geographic Society
National Inholders Association
National Parks & Conservation Association
National Wildlife Federation
Ocean Reef Club
Organized Fishermen of Florida
Quakenasse Hollow Airport Company
Rosentiel School of Marine and Atmospheric Sciences
Sierra Club
South Dade Audubon Society
Southeastern Fisheries Association, Inc.
The Wilderness Society
The Greater Homestead/Florida City Chamber of Commerce
The Conservancy, Inc.
Trail Indian Independent Baptist Church
Tropical Audubon Society
Unified Sportsmen of Florida
Wilderness Society

Companies

Anysa Land Investment Corporation
Benco Realty Corporation
Collier-Monroe, Inc.
Connel-Metcalf & Eddy, Inc.
Context Development Company
Dines Investment Company
Everglades Canoe Outfitters
Everglades National Park Boat Tours
Everglades Park Catering, Inc.
Fairchild Tropical Gardens
First National Bank of Homestead

First National Bank & Trust Company
Flamingo Inn
Florida Acreage Investors
Florida Power and Light Company
Florida Publishing Company
Fodor Guides
Gables Tours
Glade & Grove Supply Company
Grace Building Company, Inc.
Janis & King, Inc.
Keynoter Publishing Company, Inc.
Miami Shores Electric, Inc.
Pines 'n Palms Rancho, Inc.
Republic Airlines
Russ Mason's Natural History Tours, Inc.
Rustic Campsites, Inc.
Security Estates, Inc.
Tropical Bio-Industries, Inc.
United Telephone Company of Florida

Mineral Interests

Chevron USA, Inc.
Chris Jensen & Associates, Inc.
Collier Development Corporation
Collier Enterprises
Collier Resources
Exxon Company, U.S.A.
Hughes Eastern Petroleum, Ltd.
Sunland Service, Inc.
Texaco, Inc.

Newspapers and Magazines

AAA World Magazine
AM News
Associated Press
Bradenton Herald
Christian Science Monitor
Diario Las Americas
El Sol De Hialeah Newspaper
Everglades Echo
Fighter Forum
Florida Business Report
Florida Keys Angler
Florida Keys Keynoter
Florida Times Union
Fort Lauderdale News
Fort Lauderdale News/Sun Sentinel

Fort Myers News Press
Gulfshore Life Magazine
Homestead Newsleader
Jacksonville Journal
Key West Citizen
Latin News
Liberty News
Immokalee Bulletin
Miami Herald
Miami News
Miami/South Florida Magazine
Naples Daily News
New York Times
News Leader
Orlando Sentinel Star
Palm Beach Post
Pleasure Boating
Reporter, Tavernier Key
Reuters News Service
St. Petersburg Times
Sarasota Herald Tribune
South Dade News Leader
South Miami Community Newspaper
Speaking of Business
Stuart News
Sun Daze
Sun Reporter Newspapers
Tallahassee Democrat
Tampa Tribune
Travel Weekly
U.S.A. Today
Wall Street Journal
Welcome Publishing Company
Wetlands Newsletter
Where Magazine

Radio and Television Stations

WAXY
WBBI
WCIX
WCKT
WCMQ
WDNA
WEZI
WGBS
WINK
WINZ
WIOD
WKAT

WLRN
WLTY
WNBM
WODI
WPBT
WPLG
WQBA
WQDI
WRHC
WSYN
WTYJ
WWOK
WYCG

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APPENDIXES / SELECTED BIBLIOGRAPHY / INDEX

APPENDIX A: LEGISLATION

An Act to establish the Big Cypress National Preserve in the State of Florida, and for other purposes. (88 Stat. 1255) (P.L. 93-440)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) in order to assure the preservation, conservation, and protection of the natural, scenic, hydrologic, floral and faunal, and recreational values of the Big Cypress Watershed in the State of Florida and to provide for the enhancement and public enjoyment thereof, the Big Cypress National Preserve is hereby established.

(b) The Big Cypress National Preserve (hereafter referred to as the "preserve") shall comprise the area generally depicted on the map entitled "Big Cypress National Preserve", dated November 1971 and numbered BC-91,001, which shall be on file and available for public inspection in the Offices of the National Park Service, Department of the Interior, Washington, District of Columbia, and shall be filed with appropriate offices of Collier, Monroe, and Dade Counties in the State of Florida. The Secretary of the Interior (hereafter referred to as the "Secretary") shall, as soon as practicable, publish a detailed description of the boundaries of the preserve in the Federal Register which shall include not more than five hundred and seventy thousand acres of land and water.

(c) The Secretary is authorized to acquire by donation, purchase with donated or appropriated funds, transfer from any other Federal agency, or exchange, any lands, waters, or interests therein which are located within the boundaries of the preserve: *Provided,* That any lands owned or acquired by the State of Florida, or any of its subdivisions, may be acquired by donation only: *Provided further,* That no Federal funds shall be appropriated until the Governor of Florida executes an agreement on behalf of the Sate which (i) provides for the transfer to the United States of all lands within the preserve previously owned or acquired by the State and (ii) provides for the donation to the United States of all lands acquired by the State within the preserve pursuant to the provision of "the Big Cypress Conservation Act of 1973" (Chapter 73-131 of the Florida Statutes) or provides for the donation to the United States of any remaining moneys appropriated pursuant to such Act for the purchase of lands within the preserve. No improved property, as defined by this Act, nor oil and gas rights, shall be acquired without the consent of the owner unless the Secretary, in his judgment, determines that such property is subject to, or threatened with, uses which are, or would be, detrimental to the purposes of the preserve. The Secretary may, if he determines that the acquisition of any other subsurface estate is not needed for the purposes of the preserve, exclude such interest in acquiring any lands within the preserve. Notwithstanding the provisions of section 301 of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (84 Stat. 1894, 1904) the Secretary (i) may evaluate any offer to sell land within the preserve by any landowner and may, in his discretion, accept any offer not in excess of $10,000 without an appraisal and (ii) may direct an appraisal to be made of any unimproved property within the preserve without notice to the owner or owners thereof. Notwithstanding any other provision of law, and federally owned lands within the preserve shall, with the concurrence of the head of the administering agency, be transferred to the administrative jurisdiction of the Secretary for the purposes of this Act, without transfer of funds.

SEC. 2. (a) In recognition of the efforts of the State of Florida in the preservation of the area, through the enactment of chapter 73-131 of the Florida statutes, "The Big Cypress Conservation Act of 1973", the Secretary is directed to proceed as expeditiously as possible to acquire the lands and interests in lands necessary to achieve the purposes of this Act.

(b) Within one year after the date of the enactment of this Act, the Secretary shall submit, in writing, to the Committee on Interior and Insular Affairs and to the Committees on Appropriations of the United States Congress a detailed plan which shall indicate:

(i) the lands and areas which he deems essential to the protection and public enjoyment of this preserve.

(ii) the lands which he has previously acquired by purchase, donation, exchange or transfer for administration for the purpose of this preserve, and

(iii) the annual acquisition program (including the level of funding) which he recommends for the ensuing five fiscal years.

(c) It is the express intent of the Congress that the Secretary should substantially complete the land acquisition program contemplated by this Act within six years after the date of its enactment.

SEC. 3. (a) The owner of an improved property on the date of its acquisition by the Secretary may, as a condition of such acquisition, retain for himself and his heirs and assigns a right of use and occupancy of the improved property for a definite term of not more than twenty-five years or, in lieu thereof, for a term ending at the death of the owner or the death of his spouse, whichever is later. The owner shall elect the term to be reserved. Unless this property is wholly or partially donated to the United States, the Secretary shall pay the owner the fair market value of the property on the date of acquisition less the fair market value, on that date, of the right retained by the owner. A right retained pursuant to this section shall be subject to termination by the Secretary upon his determination that it is being exercised in a manner inconsistent with the purposes of this Act, which shall include the exercise of such right in violation of any applicable State or local laws and ordinances, and it shall terminate by operation of law upon the Secretary's notifying the holder of the right of such determination and tendering to him an amount equal to the fair market value of that portion of the right which remains unexpired.

(b) As used in this Act, the term "improved property" means:

(i) a detached, one family dwelling, construction of which was begun before November 23, 1971, which is used for noncommercial residential purposes, together with not to exceed three acres of land on which the dwelling is situated and such additional lands as the Secretary deems reasonably necessary for access thereto, such land being in the same ownership as the dwelling, and together with any structures accessory to the dwelling which are situated on such lands and

(ii) any other building, construction of which was begun before November 23, 1971, which was constructed and is used in accordance with all applicable State and local laws and ordinances, together with as much of the land on which the building is situated, such land being in the same ownership as the building, as the Secretary shall designate to be reasonably necessary for the continued enjoyment and use of the building in the same manner and to the same extent as existed in November 23, 1971, together with any structures accessory to the building which are situated on the lands so designated. In making such designation the Secretary shall take into account the manner of use in which the building, accessory structures, and lands were customarily enjoyed prior to November 23, 1971.

(c) Whenever an owner of property elects to retain a right of use and occupancy as provided in this section, such owner shall be deemed to have waived any benefits or rights accruing under sections 203, 204, 205, and 206 of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (84 Stat. 1894), and for the purposes of such sections such owner shall not be considered a displaced person as defined in section 101(6) of such Act.

SEC. 4. (a) The area within the boundaries depicted on the map referred to in section 1 shall be known as the Big Cypress National Preserve. Such lands shall be administered by the Secretary as a unit of the National Park System in a manner which will assure their natural and ecological integrity in perpetuity in accordance with the provisions of this Act and with the provisions of the Act of August 25, 1916 (39 Stat. 535; 16 U.S.C. 1–4), as amended and supplemented.

(b) In administering the preserve, the Secretary shall develop and publish in the Federal Register such rules and regulations as he deems necessary and appropriate to limit or control the use of Federal lands and waters with respect to:

(1) motorized vehicles,

(2) exploration for and extraction of oil, gas, and other minerals,

(3) grazing,

(4) draining or constructing of works or structures which alter the natural water courses,

(5) agriculture,

(6) hunting, fishing, and trapping,

(7) new construction of any kind, and

(8) such other uses as the Secretary determines must be limited or controlled in order to carry out the purposes of this Act: *Provided,* That the Secretary shall consult and cooperate with the Secretary of Transportation to assure that necessary transportation facilities shall be located within existing or reasonably expanded rights-of-way and constructed within the reserve in a manner consistent with the purposes of this Act.

SEC. 5. The Secretary shall permit hunting, fishing, and trapping on lands and water under his jurisdiction within the preserve in accordance with the applicable laws of the United States and the State of Florida, except that he may designate zones where and periods when no hunting, fishing, trapping, or entry may be permitted for reasons of public safety, administration, floral and faunal protection and management, or public use and enjoyment. Except in emergencies, any regulations prescribing such restrictions relating to hunting, fishing, or trapping shall be put into effect only after consultation with the appropriate State agency having jurisdiction over hunting, fishing, and trapping activities. Notwithstanding this section or any other provision of this Act, members of the Miccosukee Tribe of Indians of Florida and members of the Seminole Tribe of Florida shall be permitted, subject to reasonable regulations established by the Secretary, to continue their usual and customary use and occupancy of Federal or federally acquired lands and waters within the preserve, including hunting, fishing, and trapping on a subsistence basis and traditional tribal ceremonials.

SEC. 6. Notwithstanding any other provision of law, before entering into any contract for the provision of revenue producing visitor services,

(i) the Secretary shall offer those members of the Miccosukee and Seminole Indian Tribes who, on January 1, 1972, were engaged in the provision of similar services, a right of first refusal to continue providing such services within the preserve subject to such terms and conditions as he may deem appropriate, and

(ii) before entering into any contract or agreement to provide new revenue-producing visitor services within the preserve, the Secretary shall offer to the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida the right of first refusal to provide such services, the right to be open for a period of ninety days. Should both Tribes respond with proposals that satisfy the terms and conditions established by the Secretary, the Secretary may allow the Tribes an additional period of ninety days in which to enter into an inter-Tribal cooperative agreement to provide such visitor services, but if neither tribe responds with proposals that satisfy the terms and conditions established by the Secretary, then the Secretary shall provide such visitor services in accordance with the Act of October 9, 1965 (79 Stat. 969, 16 U.S.C. 20). No such agreement may be assigned or otherwise transferred without the consent of the Secretary.

SEC. 7. Within five years from the date of the enactment of this Act, the Secretary shall review the area within the preserve and shall report to the President, in accordance with section 3 (c) and (d) of the Wilderness Act (78 Stat. 891; 16 U.S.C. 1132 (c) and (d)), his recommendations as to the suitability or nonsuitability of any area within the preserve for preservation as wilderness, and any designation of any such areas as a wilderness shall be accomplished in accordance with said subsections of the Wilderness Act.

SEC. 8. There are authorized to be appropriated such sums as may be necessary to carry out the provisions of this Act, but not to exceed $116,000,000 for the acquisition of lands and interests in lands and not to exceed $900,000 for development. Any funds donated to the United States by the State of Florida pursuant to chapter 73-131 of the Florida statutes shall be used solely for the acquisition of lands and interests in land within the preserve.

Approved October 11, 1974.

Legislative History:

House Report No. 93-502 (Comm. on Interior and Insular Affairs).
Senate Report No. 93-1128 (Comm. on Interior and Insular Affairs).
Congressional Record:
  Vol. 119 (1973): Oct. 3, considered and passed House.
  Vol. 120 (1974): Sept. 9, considered and passed Senate, amended.
    Sept. 24, House concurred in Senate amendments with amendments.
    Oct. 1, Senate concurred in House amendments to Senate amendments.

APPENDIX B: AREA OF INFLUENCE FOR OIL AND GAS DEVELOPMENT AND AN ACCEPTABLE LEVEL OF DEVELOPMENT

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CRITERIA

Nine criteria have been identified for use in this discussion to determine a generic area of influence around oil and gas developments. They include noise, visual quality, hydrology, water quality, odor, vegetation and soils, air quality, and wildlife. One nonenvironmental criterion is also addressed – visitor use. Significant cultural resources are not discussed because these sites would be avoided in all cases. Each criterion was analyzed by assessing how oil and gas development could affect it, or has affected it already. Generic influences that could occur during various phases of oil and gas development are discussed, and examples are provided where available. An area distance, or area of influence, is also assigned to each criterion. This concept is not new. For instance, the Forest Service (1987) applied a 0.5-mile area of influence to an oil and gas proposal in grizzly bear habitat in Wyoming, stating that this was "the distance in which grizzlies would be affected by the activity."

Noise

Noises caused by human intrusion, especially those from a fixed source, can significantly alter the actual and perceived character of the preserve. The major concern with noise impacts is the relative level of noise present, not the absolute value of the noise. Stated differently, it is not the projected presence of high decibel levels in the preserve that may be objectionable, rather it is that these levels may represent a great increase over existing ambient sound levels in the preserve. There are important distinctions between existing noises (ambient noise) and those that may be introduced because of oil and gas development. These distinctions include characteristics of the noises, the area affected by noise sources, and the degree to which existing sources serve the functions of the public and the National Park Service.

There are no absolute standards that define unacceptable levels, duration, or qualities of environmental noise. The Forest Service (1980b) has established subjective audibility guidelines that they currently use to assess noise impacts for various recreational opportunities. These guidelines are expressed in table B–1, and they relate recreational opportunities to the corresponding acceptable level above ambient noise levels. Further, the U.S. Department of Energy suggests that there is a "strong likelihood of individual complaints" when the intruding noise is greater than 10 decibels above ambient noise levels.

Table B–1: Acceptable Levels above Ambient Noise levels for Various Recreational Opportunities

Recreational Opportunity	Acceptable dB level
Appropriate for primitive recreational areas; intruding noise not detectable	0
Appropriate for trail camps, will not wake most sleepers; intruding noise normally not detectable	5
Appropriate for undeveloped roadside camps and those accessible by 4-wheel-drive and all-terrain vehicles	10
Appropriate for roadside camps accessible by highway vehicles	20
Appropriate for highly developed campgrounds in a quiet, suburban neighborhood	40

Source: Forest Service 1980b.

The influences on wildlife from noise are generally associated with human presence and other stimuli, such as sight and smell. Wildlife studies indicate that factors affecting animal response to human disturbance include the intensity of the stimulus, the frequency of the stimulus, the experience of the animal in association with the stimulus, the condition of the animal at the time of the disturbance, and environmental conditions. Wildlife responses to disturbance are behavioral and metabolic. Behavioral responses relate primarily to movement, including remaining motionless to avoid detection, seeking cover, aggressiveness, or abandonment of home range. Metabolic responses, occurring simultaneously, include increased heart rates and stress.

Four general phases of oil and gas development are described in the "Affected Environment" section – geophysical operations, drilling, production, and abandonment and reclamation. Each of these phases produces noise that has the potential for affecting the preserve in different ways and at different levels. Much of the information about noise effects, by phase, has been extracted from the report, "Oil and Gas Technology and Associated Environmental Effects," prepared for the National Park Service by Tetra Tech, Inc. 1987.

Geophysical Operations. Noise from geophysical operations would have some influence on the environment. Field equipment produces little noise, except for motorized trench-digging or core-drilling equipment used for subsurface sampling in geochemical prospecting. The greatest noise sources would be vehicles used to access the area, whether ORV or helicopter. Passage of these vehicles would temporarily disrupt an otherwise quiet environment in roadless areas, possibly affecting wildlife movements. For instance, an F-15 overflight study at Merritt Island National Wildlife Refuge showed that airboats disturbed birds more than supersonic jet aircraft (Black and Collopy 1984). Brief noise levels associated with helicopters may be as high as 90 dBA at 1,000 feet. Repeated passage of exploration vehicles, especially helicopters, would also be disruptive for recreationists in the area. Helicopters also disrupt wildlife, as evidenced by their effects on wading bird colonies (Kushlan 1979).

The use of explosives in seismic surveys also affects the environment's normal noise levels. Most explosives are used belowground, thereby minimizing audible sound. But wildlife can often feel the shock waves from the blast even if no sound can be heard, possibly resulting in temporary stress or behavioral changes (Tetra Tech, Inc. 1987). The noise effects on visitors are negligible because only the exploration crew is allowed in the blasting area.

Drilling. Road construction to the drill site and pad requires heavy equipment such as bulldozers and graders, which contribute to the overall noise effects. Car and truck traffic associated with drilling activities are also a source of noise. Cars would carry the work crews, and supply vehicles would usually be large trucks. Vehicle traffic associated with the drilling would be intermittent. The actual number of vehicle trips depends on many factors and would be quite variable. Roads are a linear source of noise, as opposed to drill sites (which are a point source) and, therefore, have the potential to affect a greater area, even though effects would probably be short-term.

Drilling operations are a noisy activity. Drill rigs generate noise from several sources, including main and auxiliary engines, pumps, and supply handling. Stratigraphic test drilling usually requires a truck-mounted drill rig that is much smaller than that required for wildcat or development well drilling, and thus quieter. The duration of core drilling would also be much shorter than for wildcat or development well drilling because of the shallower depths involved.

A drill rig has both large main and smaller auxiliary engines that would be a continuous source of mid- to low-frequency noise. Pumps and other mechanical equipment, which are also a part of the drill rig, would generate a variety of noises. Handling of materials such as drill pipe or well casing can be a source of sharp, high frequency noises, with metal banging against metal. Table B–2 illustrates representative noise levels in decibels from motor vehicle and routine operations associated with drilling.

Table B–2: Representative Noise Levels Associated with Drilling Operations

Equipment	Decibels (dBA)	Distance from Source
Dozer	80	50 ft
Chain saw	83	50 ft
Truck	72 - 95	50 ft
Motorboat	80	50 ft
Helicopter	70 - 90	1,000 ft
Generic drill rig	85	100 ft

Source: Tetra Tech, Inc. 1987.

Production. Production operations contribute noise from a variety of sources. Noise from well completion activities is produced by truck traffic and the pumps and engines required for acidizing or fracturing. Beam pumps used to produce oil would generate noise; the level depends on the type of prime mover used. Although noise levels from internal combustion engines are highly variable, electric motors are generally quieter. Workover rigs can be as noisy as a drill rig, producing about 85 dBA at a distance of 100 feet.

Considerable traffic is associated with the installation, operation, and maintenance of production equipment. Large equipment requires large trucks for delivery, which are inherently noisier than smaller trucks or passenger vehicles. The construction of oil and gas pipelines is noisy due to the use of heavy equipment and associated truck traffic. Bulldozers used for pipeline construction and other site preparation work generate approximately 80 dBA at a distance of 50 feet. Pipeline pumping/compressor stations generate a substantial amount of noise from the large engines and pumps.

Many of the above sources of noise are intermittent and sometimes rarely generated. Others, however, are continuous. Beam pumps, pipeline pumping/compressors, stations and field treatment equipment and engines all run continuously. Vehicle traffic, while occurring on a continuing basis throughout a producing field, would be intermittent at any one place. The activity associated with pipeline construction, although intense, lasts only for a short period at any one place and occurs only once for each line.

Abandonment and Reclamation. Abandonment and reclamation operations contribute noise from several sources, including well plugging, earthmoving, and transportation. The various types of pumps used in well plugging can affect the noise environment. Pumps are usually powered by internal combustion engines. Earthmoving activities can involve grading and recontouring, and the use of heavy dozers and graders can cause very high noise levels.

Car and truck traffic associated with abandonment and reclamation activities are also a source of noise. Cars carry the work crews, and large trucks carry well-plugging equipment and supplies, as well as earthmoving equipment and reclamation materials.

Area Distance Determination. A sound and vibration study was conducted for Exxon Company in December 1985, during conductor casing drive hammer operations at the Collier 2–4 well (Vibra-Tech South Corporation 1986). The results of this study indicated a decibel level of 110 at a distance of 10 feet from the onsite generators during drive hammer operations and less than 40 decibels at a point approximately 2 miles away along Eleven Mile Road during and without drive hammer operations. Nondriving decibel levels at the site matched those recorded by Exxon at another well during deep drilling operations. Table B–3 illustrates the results of this study.

Appendix B

Table B–3: Decibel Levels at Various Locations in and around the Raccoon Point Field (Wells 22-3 and 2-4, December 3–20, 1985)

Location of Reading		Decibel Level (dbA)
1. 10' from Exxon job trailer, on well 22-3, while pulling out		84
2. 10' from Exxon job trailer, on well 2-4, while drilling caprock		85
3. 10' from Exxon job trailer:	driving* 50' to 90'	93
4. 1,000' south of rig:	driving 50' to 90'	72
	nondriving**	64
5. 1,000' northeast of rig:	driving 90' to 130'	73
	nondriving	64
6. 2,000' northeast of rig:	driving 130' to 150'	65-68
	nondriving	48-50
7. 2,500' northeast of rig:	driving 150' to 170'	61-64
	nondriving	49-59
8. 2,000' east of rig:	driving 130' to 170'	63-67
	nondriving	49-53
9. 1,000' east of rig:	nondriving	73
10. 1,000' north of rig:	driving 170' to 190'	74***
	nondriving	66
11. 2,400' northwest of rig, at stop 23:	driving 190' to 200'	61-64
	nondriving	48-50
12. 5,000' northwest of rig, at stop 22:	driving 200' to 215'	58-62
	nondriving	45-48
13. 7,600' west of rig, at stop 21:	driving 215' to 240'	58-61
	nondriving	42-44
14. 8,500' southwest of rig, at stop 20:	driving 240' to 250'	45-49
	nondriving	40-43
15. 9,200' southwest of rig, at stop 19:	driving 250' to 260'	44-48
	nondriving	≤40
16. 10,000' southwest of rig, at stop 18:	driving and nondriving	≤40
17. 12,000' southwest of rig, at stop 17:	non-driving	<40 (at all times)

Source: Vibra-Tech South Corporation 1986.

*Driving – typical drilling and drive hammer operations.
*Nondriving – no drive hammer operations; only typical drilling and associated activities (e.g., vehicle use, heavy equipment, generators).
**May be higher due to operational wells nearby.

Although this study provides valuable preserve-specific information on noise levels radiating from a pad and drill site, several inferences must be made to determine a distance for the area of influence. First, the recording instrument used in this study had a low range of 40 dBA, well above the ambient noise levels of many natural areas. Thus, although noise levels could not be measured during nonpile driving periods at a distance of 10,000 feet, more sensitive equipment might have been able to record noise levels at greater distances from the source. Second, no ambient noise levels have been recorded in the preserve. A study at Bryce Canyon National Park found that typical background noise levels fell below 20 decibels (Foch 1980), and research conducted at Glacier National Park determined ambient noise levels to be between 20 and 35 decibels (Foch and Burke 1985). Third, environmental factors such as water, vegetation type, and climatic conditions can greatly affect the movement of noise. The Exxon study was conducted in December 1985, the characteristically dry season in the preserve. Readings may have been considerably different if taken during the wet summer season.

By applying the Forest Service's noise acceptability guidelines to the preserve, and assuming that 20 decibels is a reasonable ambient noise level, a nondriving (normal drill pad activities) decibel level of 40 at 10,000 feet from the source is still 20 decibels over the ambient noise level. According to the Forest Service guidelines (table B–1), this noise level is "appropriate for roadside camps accessible by highway vehicles." Since much of the existing and proposed oil and gas developments in the preserve are, or would be, in remote areas, these decibel levels are still very high. Therefore, a generic area of influence distance for noise impact has been conservatively set at 2 miles.

Visual Quality

The different phases of oil and gas development may influence visual quality in several ways, such as soil and vegetation disruption, color contrast, and the alteration of the skyline. Where the phases differ is in the length of time that the effect is present. Exploration and drilling activities may last for only a few months, but a single production activity may last as long as 40 to 80 years. Reclamation activities, regardless of how well they are performed, may still not provide a total return to a natural condition.

The level of influence varies greatly, depending on the vegetative community. Developments in the middle of a large prairie may be visible for 2 to 3 miles; but with a dense vegetation screen, it may be visible from only a few hundred feet.

Geophysical Operations. Disruption of surface vegetation for temporary trails and seismic lines, ruts caused by vehicles, and the presence of vehicles and workers in a natural setting are the major visual effects associated with exploration activities. This phase is of short duration, but the effects of exploration on soil and vegetation may be seen for as long as five years, even with reclamation.

Drilling. Disruption of surface vegetation and soils for access roads and drill pads is a major source of visual effect. These areas are void of vegetation, raised above the natural contour, and are of a color (white limestone) that is highly reflective and contrasts with the natural surroundings.

Drilling activities cause visual effects in otherwise nonindustrial areas. Drilling rig derricks and masts may reach 200 feet and could be visible for miles. Drilling fluid reserve pits, which may take up a substantial proportion of the area cleared for the drill site, are unsightly. In the preserve, the requirement that containerized systems be used on new developments has reduced much of this visual effect. Flaring of waste gases, vehicles providing equipment and supplies for the drilling activity, and refuse and debris associated with drilling are other visual effects. Much drilling activity occurs at night, and area lighting can make it difficult to see the night sky (i.e., individual stars and constellations cannot be easily seen).

Production. The discovery of economical reserves of oil and gas may result in full-field development and the long-term (40-80 years) disruption of soils and vegetation. Production equipment and activities would cause visual effects in otherwise nonindustrial areas. These include wellhead equipment, pumping equipment, workover rigs, separation and treatment equipment, storage tank batteries, areas of disrupted vegetation from oil and brine spills, pipelines, electrical transmission lines, waste gas flares, and enhanced recovery equipment such as steam generators. They could be visible for 2-3 miles in a prairie environment and would contrast with the natural surroundings. Service vehicles would be present on access roads and pads, and refuse and other debris may accumulate.

Abandonment and Reclamation. Visually, reclaimed roads and pads may require many decades to return to a somewhat natural condition. Disruption of soil composition causes vegetative species composition and successional stages to differ from the surrounding undisturbed landscape. Several existing reclaimed roads and pads are clearly distinguishable and are likely to remain evident for many years (Radian Corporation 1986).

Area Distance Determination. The virtually flat relief of the preserve and the dense vegetation in certain areas help to hide much of the development when viewed from ground level. A cursory analysis of a vegetation map showed that most existing development could not be seen from more than a mile because of vegetation; also the Sunniland trend, the most probable productive oil and gas area in the preserve, contains a surface mosaic of old-growth pine, hardwood hammocks, marsh, and prairie, making long-distance views uncommon. The vast expanses of prairie in the central and southern portions of the preserve would allow oil and gas developments to be seen at great distances (possibly 2-3 miles). However, most development is likely in the mosaic vegetation areas of the trend, and development at a distance of over 0.5 mile on a flat surface is probably not obtrusive (at least after drilling operations are complete and the derrick is dismantled). Since the range of sight distances can vary from less than 100 feet to over 3 miles, a 0.5-mile generic area of influence distance has been established.

Hydrology

General Effects. The long-term effects of geophysical operations on hydrology are not fully understood. Shot holes would be plugged, and sediment islands created during drilling would be leveled to existing contours. Soil rutting would be minimal. New access road and pad development associated with drilling and production would have minimal and localized effects due to NPS requirements for construction. Pads would be oriented to minimize the blockage of water flows, and access roads would be constructed with drainage structures to allow for water movement. Localized effects could include altering flow velocity and patterns, water temperature, substrate type, the timing of the freshwater pulse to estuarine areas, and ultimately, the composition of vegetative species on either side of the development. Reclamation would mitigate most effects, but since it is not feasible to remove all fill material once a pad and road are abandoned, there would be minor localized but potentially long-term disruption of surface flow patterns caused by residual materials in combination with shallow depressions and rutting caused by heavy machinery. An inventory of abandoned oil and gas sites in the preserve has indicated a difference in the hydrological head in different locations of pads and roads and differences in water depths by location (NPS 1985a).

Area Distance Determination. The extent of hydrological effects would depend on the hydrological characteristics of the area where oil and gas development occurred and the downstream area's reliance on water quantity and quality. Monitoring of the abandoned sites has indicated hydrological changes in the immediate vicinity of pads and roads. An area of influence distance of 500 feet has been established to include the localized hydrological effects.

Water Quality

Geophysical Operations. Geophysical activity, though of short duration, has the potential to affect water quality. Shot holes may cause groundwater contamination due to cross-contamination of aquifers and turbidity due to drilled materials.

Leaked fluids from vehicles may pollute surface waters; however, the quantities would likely be a gallon or less, so impacts would be minimal.

Drilling and Production. Turbidity and sedimentation could occur due to clearing, deposition, and grading activities associated with road and pad construction. Surface spills of production fluids would affect surface water quality near producing wells. Spills of crude oil or brines would be possible at the wellhead, at the tank battery, or along the pipelines. While crude oil can have severe effects on the environment, brine spills may be more damaging in both the short and long-term.

The amount of freshwater used for drilling operations in the preserve can be enormous. The average volume of freshwater extracted from shallow wells during a typical 45-day drilling operation in the preserve is 1,323,000 gallons (personal communication, Palmer, Exxon 1987). Wastewater is then pumped into the "boulder zone," an unconsolidated formation found between 1,800 and 4,000 feet. The effects on the aquifer from freshwater removal and from wastewater discharge into the boulder zone are unknown.

Oil spills could occur at any point along a pipeline route. A small leak could go undetected for days, resulting in a sizable release of crude oil. If a spill occurred during high-water conditions, oil would spread along the direction of sheet flow as much as 0.25 to 0.5 mile per day. Several minor spills have occurred, but none has resulted in major surface effects. Preserve records indicate that during 1985 and 1986 there were 17 oil and brine spills recorded in the preserve. These spills range in size from under 10 gallons to almost 6,000 gallons. In most cases, less than 1 acre was affected before remedial actions were taken. However, a major spill due to a pipeline break in conservation area 3A (outside the preserve) in 1986 dumped 5,060 gallons of produced oil, creating a 4-mile-long plume approximately 200 feet wide, affecting about 100 acres.

In addition to crude oil and brine spills, other potential water contaminants are well fluids, drilling fluids, cement, chemical dispersants, acidizing and fracturing fluids, production chemicals, and construction materials and wastes. The use of containerized systems and drip pans under drilling facilities would greatly reduce the potential for adverse effects from many of these contaminants.

If oil or brine was spilled or leaked onto dry ground, it could percolate downward to the groundwater table. Upon reaching groundwater, most of the constituents would spread along the groundwater surface and assume the direction of lateral groundwater flow, making cleanup extremely difficult and costly. A loss of produced water brines from a temporary surface storage facility from 1984 to 1986 degraded groundwater quality and resulted in damage to vegetation downgradient from the impoundment. A 3-acre "dead zone" of pond cypress was reported, and abnormal pond cypress growth was reported in a 7-acre area, extending approximately 700 feet from the source (NPS, Roy et al. 1987).

Drilling into pockets of oil or gas that are in natural equilibrium with the subsurface geologic environment could introduce oil or gas into other sedimentary zones if the well casing broke. The most probable reason for a casing failure would be faulty installation or corrosion of the casing by strong brine solutions. Although these types of failures would be unlikely, the leakage of hydrocarbons into other strata could cause several underground effects. If a casing ruptured, crude oil, natural gas, and brines would be introduced into the groundwater system. Oil and gas would migrate upward to a local stratigraphic trap or possibly to the surface. Potable groundwater supplies, which are only 20 to 30 feet below the surface, would most likely be affected by surface spills of hydrocarbons, brines, or other chemicals and not by subsurface leaks. If droplets of oil or escaping natural gas percolated into the groundwater, the odor and taste of drinking water would be affected, and a visible oil film might result. This could have severe effects in Florida, where over 90 percent of the potable water comes from aquifers, and within the preserve, where all potable water is from wells.

Abandonment and Reclamation. Exposed soil areas during fill removal, grading, and recontouring activities associated with reclamation may contribute to erosion and sedimentation of surface water. Minor effects to surface water may also result from leaks from service vehicles and the dismantling of production equipment. Groundwater contamination may occur from surface leaching and from the introduction of well fluids into groundwater aquifers. Improperly cemented wells could allow hydrocarbons or brines to contaminate freshwater formations.

Area Distance Determination. The extent of the water quality effect would depend on the quantity and type of pollutant spilled, the surface and underground hydrology of the area where the spill occurred, and the downstream areas relying on water quality. Since water flows in the preserve generally increase from north to south (Schneider 1986), the likelihood of water quality effects extending a greater distance could be increased for developments in the southern portions of the preserve, especially during high water flows in the summer months. Since little monitoring and research has been conducted on these effects, few examples are available for use in distance determination. A generic area of influence has been established as 1,000 feet, using the 1987 groundwater/vegetation impact study and the conservation area 3A spill as references.

Odor

General Effects. The general effects of odors on preserve visitors may be rather slight since human olfactory senses are not well developed. Odors, however, along with sight and sound, are the major factors that alert wildlife to human presence. The wildlife responses to this human disturbance are both behavioral and metabolic. Behavioral responses relate primarily to movement, including remaining motionless to avoid detection, seeking cover, aggressiveness, or abandonment of home range. Metabolic responses, which occur simultaneously, include increased heart rate and increased stress levels. Wildlife studies indicate that factors affecting animal response to human disturbance include the intensity of the stimulus, the frequency of the stimulus, the experience of the animal in association with the stimulus, the condition of the animal at the time of the disturbance, and environmental conditions.

Odors most frequently associated with oil and gas development include smoke from slash burning and well fires, vehicle exhaust, and hydrogen sulfide gas.

Area Disturbance Determination. Hydrogen sulfide gas can be detected by humans at distances over a mile. Since visitors differ in their perceptions of odors, it is difficult to assess the impact of these odors on them. NPS personnel who have dealt extensively with oil and gas operations at Theodore Roosevelt National Park, however, state that hydrogen sulfide odors can be pungent at distances of 600 feet from the source and can be detected at over 1 mile. Smoke from well fires and slash burning could carry much farther than that, depending on climatic conditions. Wildlife may be affected by odors due to general human presence, but no data are currently available. A generic area of influence for odor has been established as 1 mile.

Vegetation and Soils

Geophysical Operations. Seismic work in the preserve would cause localized and temporary disruption along established seismic lines. The effect on herbaceous vegetation would be temporary. Where woody vegetation was cut, however, reestablishment would take longer, depending on the size and age of the vegetation removed.

Soil compaction could occur from heavy vehicle use and would be most noticeable in seismic surveys involving heavy equipment that pound or vibrate the earth to create shock waves. Soil movement due to heavy equipment or blasting could cause ruts and adjacent sediment islands, which are prime areas for exotic vegetation encroachment.

The width of a seismic line corridor (where vegetation and soil effects would occur) is approximately 15 feet, which is equal to about 1.8 acres/mile.

Drilling. Constructing access roads for exploratory drilling would remove vegetation along an estimated 20-foot-wide corridor, resulting in about 2.5 acres of vegetation removed per mile of road. Each drill pad would remove about 2 acres of vegetation. Major, localized siltation could result in further destruction of adjacent vegetation by smothering the roots. The amount of siltation would depend on water conditions during road and pad construction. Any sand or marl soil would be covered by 3-4 feet of limestone fill.

Production. Full production and associated field development would probably result in the construction of more access roads and certainly larger pads. Megapads (multiple wells on one large pad) typically encompass 12 acres each in the preserve. All vegetation under these roads and pads would be destroyed, as well as some possible destruction of adjacent vegetation from siltation, brines, and toxic chemicals. Because limestone fill roads and pads will likely exist for long periods of time, weedy exotic species could invade these areas. Disturbed sites are often invaded by exotic plants, and once the exotics take hold, a seed source is available to spread exotics to the surrounding area. Stipulations relating to the control of exotic plants would be attached to any plans of operations where invasion by exotic plants is a concern.

Abandonment and Reclamation. Reclamation activities would require the removal of the limestone fill, an action that could cause sedimentation of adjacent areas. Restoration of the original grade would in most cases require substrate fill that could also cause sedimentation. Revegetation with native plant species would have to be closely monitored to prevent invasion by exotic species. The preserve currently has an active exotic vegetation control program that targets principally melaleuca, Australian pine, and schinus (Brazilian pepper). Stipulations relating to the control of exotic plants may be applied as necessary.

Area Distance Determination. Direct effects on vegetation and soils would be confined to the primary effects areas (access roads and pads) and immediately adjacent areas. Soil contamination from oil, brine, and production fluids could contaminate soils, ultimately impacting vegetation. Water contamination due to oil, brine, and production fluids could also affect vegetation, as could changes in the hydrological regime. The extension of areas containing exotic vegetation species would also be a factor since new "staging areas" would be established for the aerial transmission of seeds. Water quality and hydrology relate very closely to soils and vegetation in the preserve. The water is relatively unpolluted, and any abrupt or permanent changes in water levels of even a few inches can result in major changes in the ecology (Schneider 1986). Examples of impacts on vegetation from hydrological changes in the preserve are not available. The effects on pond cypress due to degraded groundwater quality from brine leakage, however, is an example of how vegetation can be impacted (NPS, Roy et al. 1987). Based on that study, a generic area of influence for vegetation and soils has been established as 1,000 feet, the same as for water quality.

Air Quality

Geophysical Operations. Seismic activities related to oil and gas exploration would affect air quality primarily because of vehicle use. Smoke from internal combustion engines, as well as sulfur dioxide, nitrogen dioxide, carbon monoxide, and hydrocarbons, would cause air quality effects. Emissions from all stages of seismic activity would be localized, temporary, and intermittent.

Drilling. Drilling would create minor localized effects on air quality because of diesel fuel emissions from equipment and vehicles, fugitive dust from road and pad construction, emissions from gasoline internal combustion engines, and natural gas and volatile hydrocarbon emissions resulting from well fluids returned to the surface.

Production. Air pollution would occur from fugitive dust created by additional earth-moving, clearing, and vehicle travel; gaseous emissions from support vehicles; emissions from well fluids; and by-products from propane-fired "heater-treaters." Additional effects could occur from thick, black smoke from well fires and from toxic gases such as hydrogen sulfide.

Abandonment and Reclamation. These activities could cause fugitive dust effects from earth-movement and gaseous emissions from support vehicles.

Area Distance Determination. Air quality effects would generally be temporary and intermittent and would be most visible immediately adjacent to the source. Smoke created by slash burning or well fires, and poisonous emissions such as hydrogen sulfide, could affect wildlife and visitors at some distance. The generic area of influence for air quality has been established as 1 mile, the same as for the odor criterion.

Wildlife

General Effects. The effects of oil and gas development on individual wildlife species vary immensely because of the diversity of species and their unique habitat needs. Effects to wildlife from oil and gas developments can be categorized into three types:

(1) mortality due to vehicles, earth movement, illegal shooting, and poisoning from water contamination

(2) effects from general human disturbance (disturbance defined here as a stimulus that causes animals to alter their behavior or metabolism because of seeing, smelling, hearing, or otherwise sensing humans or human artifacts or structures)

(3) effects from loss of habitat or habitat fragmentation and disruption of normal migration or travel routes

The death of small animals is likely since they are unable to avoid vehicles and earth movement during construction activities. Large animals can generally avoid construction, but they, like smaller animals, are susceptible to death from vehicle collisions and poisoning if crude oil, brine, or toxic chemicals escape the developed area. No road-kill data for oil and gas access roads have been compiled, however, so no probabilities of incidence can be developed. No cases of wildlife poisoning due to water contamination have been recorded. Mortality from illegal and legal shooting or dogs is also unlikely because the National Park Service stipulates that work crews may not carry firearms or have dogs while working in the preserve.

Different species of wildlife also react differently to general human disturbance. Wildlife responses to disturbance that have been documented in the field, although not especially in south Florida, are behavioral and metabolic. Behavioral responses relate primarily to movement, including remaining motionless to avoid detection, seeking cover, aggressively approaching the stimulus, or abandoning an original home range or denning site. Metabolic responses occur simultaneously with behavioral responses and include increased heart rates (Ward 1980; MacArthur et al. 1979) and possibly other stress-related physiological effects. The secondary effects of altered behavior or metabolism due to disturbance vary. If the disturbance is infrequent, regular, or nonthreatening, then the overall effect on the health and condition of wildlife may not be adverse. For example, deer are frequently sighted near access roads and pads in the Raccoon Point field. However, if the disturbance is widespread and is perceived by wildlife as a menace, then secondary effects can significantly affect wildlife condition, mortality, and reproduction (Geist 1970, DeForge 1976).

Habitat loss and fragmentation, and disruption of normal travel routes, are concerns in the preserve, especially as they relate to the Florida panther. Panthers are believed to be relatively sensitive to human intrusion into their habitat (USFWS 1987a). While the best documented panther populations in the preserve coincide with the Bear Island and Raccoon Point oil fields, which could indicate a fairly high tolerance level, the current population is a remnant of a once larger, more vigorous population in the region. The demise has been attributed to loss of habitat quality due to many things, including petroleum operations and road construction (FGFWFC 1985c; USFWS 1986).

Studies of disturbance effects on another subspecies of panther (*Felis concolor*) in Arizona and Utah found that resident mountain lions altered their home range and area to avoid logging activity and logged areas (Van Dyke 1983; Van Dyke et al. 1986a and 1986b). One of the 1986 studies further showed that a female panther resided for 3 months less than 1 kilometer from an oil field and produced at least one cub, but then left its home area before the study concluded.

Area Distance Determination. Effects on wildlife from oil and gas activities are directly related to many of the effects discussed previously, including general human disturbance (noise, sight, odor), reduced water quality, hydrological changes, and habitat loss. Since individual species vary immensely in their habitat needs, the effects from oil and gas development are also quite diverse. However, since the effects associated with human disturbance (noise, sight, odor) occur within established areas of 2 miles, 0.5 mile, and 1 mile respectively, a 1-mile zone distance for wildlife has been established.

Visitor Use and Perceptions

The suspected influence on visitors from oil and gas development has already been discussed in the sections on noise, odor, and visual quality. Any activity that detracts from the natural setting may affect the recreational experience. Since everyone's perception of acceptability is different, an established level of development for the preserve would probably not satisfy all visitors. No visitor survey about oil and gas development has been conducted for the preserve, and no data exist about visitor perceptions or how visitor use may be altered because of development.

Based on a 1980 visitor survey conducted at Bryce Canyon National Park regarding potential effects on visitors from a proposed surface coal mine adjacent to the park, three major questions that need to be answered have been identified:

(1) Why do visitors go to Big Cypress National Preserve?

(2) What are the important values of the preserve?

(3) How is visitor enjoyment of certain values affected by existing, proposed, or potential future oil and gas development?

Since the situation was and is very different at Bryce Canyon National Park, it is not possible to adapt the data from that study to the Big Cypress situation. A visitor survey would be necessary to determine the visitor perceptions of oil and gas development.

No generic area of influence has been established for visitor use and perceptions since the data do not exist for the preserve.

DERIVATION OF AREA SIZE

At least two areas have been defined within the area of influence – the primary and secondary areas. A definite line between the two areas does not exist, however, due to variances in influences and changes through time. The primary influence area includes those effects to environmental criteria that generally occur rather rapidly and have measurable effects that are related directly to the oil and gas development. Primary influences can include

> alteration of sheet flow, flow velocity and patterns, water depth, water temperature
>
> decreased water quality due to sedimentation, oil spills, production fluid spills, groundwater contamination
>
> direct mortality to vegetation from cutting, trampling, or covering
>
> soil compaction
>
> soil removal or disruption
>
> soil contamination
>
> reduced air quality from vehicle emissions, volatile emissions from well fluids, fugitive dust, smoke
>
> effects on visitor use and wildlife because of nuisances (noise, sight, odor)

The secondary influence area includes those effects to the environment and visitor use that may become evident only over time and are indirectly related to oil and gas development and a continuation of effects such as noise and sight, but at a greater distance. Secondary influences can include

> changes in hydroperiod and substrate resulting in vegetation changes (from hydrological changes)
>
> vegetation and wildlife disturbances, and health and safety concerns because of water quality impacts
>
> vegetation mortality or alteration due to soil contamination
>
> vegetation and wildlife disturbances, and health and safety concerns because of air quality impacts
>
> disturbances to visitor use and wildlife because of nuisances (noise, sight, odor)

Based on this analysis of direct and indirect influences relating to the nine criteria, a generalized area of influence around oil and gas developments was established as 0.5 mile. Table B-4 summarizes the area of influence distances for each of the criteria.

Table B–4: Area of Influence Distances Established for Each Criterion

Criterion	Area of Influence Distance	Justification
Noise	2 miles	Application of U.S. Forest Service guidelines, use of ambient noise data from other national park system units, use of Exxon noise study at Big Cypress
Visual Quality	0.5 mile	Based on a review of visual distances through different vegetative communities and locations in Big Cypress
Hydrology	500 feet	Based on monitoring hydrological changes at active and abandoned roads and pads
Water Quality	1,000 feet	Based on the 1984-86 NPS study conducted at Big Cypress (NPS, Roy et al. 1987), and the conservation area 3A spill
Odor	1 mile	Based on staff observations at Theodore Roosevelt National Park
Vegetation and Soils	1,000 feet	Vegetation and soil impacts relate very closely to water quality and hydrology. Since an example is available for water quality effects, that distance was also used for vegetation and soils
Air Quality	1 mile	Since air quality effects relate to the odor criterion, that distance was used for air quality as well
Wildlife	1 mile	Since effects to wildlife are directly related to general human disturbance criteria (noise, sight, odor), a combination of those criteria was used to establish the wildlife zone distance
Visitor Use/Perceptions	None established	Impacts to visitor use and perceptions relate to many of the above impact criteria, particularly sight, odor, and noise; not a quantifiable distance for Big Cypress without a visitor survey.

Generalized area of influence for all criteria: 0.5 mile.

APPLICATION OF THE METHODOLOGY

The area of influence methodology would apply in three ways:

(1) As each new plan of operations is reviewed, an assessment can be made as to the area of influence that the proposed development would create. The area of influence of existing developments at that time could then be added to the proposed development to determine if the preserve objective of a 10 percent influence at any one time has been approached, met, or exceeded.

(2) The methodology would provide useful acreage information for analysis of cumulative effects as required for plan of operations review under the 36 CFR 9B regulations.

(3) Once this methodology is approved as part of the final general management plan, it would allow the National Park Service to determine specific influence limits for a plan of operations so that the established influence percentage would not be exceeded.

Once an oil and gas development has been adequately reclaimed, in accordance with the standards of the minerals management plan and the bond is released, the area of influence created by that development would be subtracted from the total for the preserve. That amount, expressed as a percentage, would then be available for another oil and gas development at some future time and location.

The details of this methodology will be refined through time and included in revisions to the minerals management plan. As the findings of additional research become available, the area of influence distances may be revised as necessary.

AREA OF INFLUENCE LIMIT AND EVALUATION

A 10 percent influence limit on oil and gas exploration and development is recommended, based on the best professional judgment of the National Park Service. This limitation is presented as a reasonable management decision to preserve and protect resource integrity while providing for oil and gas exploration and production.

Considerations of total area committed to oil and gas development, in terms of direct impact and adverse influence, is at present a policy question for which there are no clear answers. Questions regarding impact thresholds (e.g., how much disturbance is too much?), are clouded by so many qualifications and value judgments that answers to such questions largely remain policy decisions (Harris 1984).

Existing Disturbance

The area of existing direct disturbance related to oil and gas operations in Big Cypress National Preserve is approximately 1,117 acres. This total represents 259 acres disturbed by construction of access roads and well pads, plus 858 acres of direct surface impact caused by past geophysical surveys. (The existing area disturbed by past geophysical operations was determined by correlating location and distance of past surveys with vegetation anomalies apparent on aerial photographs. Examination revealed 474 miles of geophysical survey lines, with an average estimated impact width of 15 feet. The corresponding area of impact was calculated to be 858 acres. The acreage disturbed for road and pad construction was determined by on-the-ground measurements and analysis of aerial photographs.)

Using the 0.5-mile area of influence associated with the existing direct disturbance, it is estimated that 38,458 acres, or 6.7 percent of the preserve, are being adversely influenced by past and current oil and gas operations. Existing access roads and well pads account for 37,600 acres, and past seismic operations are continuing to adversely influence approximately 858 acres. (Note that the area of influence associated with past seismic operations reflects the actual area of direct impact; not the area extending 0.5 mile on either side of the impact lines. However, the 0.5-mile area of influence would apply during the conduct of new geophysical operations.)

Projected Disturbance

Additional direct impact to surface resources, based on the status quo oil and gas development scenario prepared by the NPS Mining and Minerals Branch, is projected to be approximately 727 acres. This total reflects the long-term direct disturbance anticipated for the construction of access roads and well pads to be 203 acres, and direct surface impact projected for geophysical surveys during the next 15 years at 524 acres (433 miles of survey lines with an impact width of 10 feet). A direct impact width of 10 feet, as opposed to the 15-foot impact width for past lines, is projected for all future geophysical survey lines due to application of operational stipulations presented in the minerals management plan.

The area of influence calculated for the amount of direct impact projected under the status quo scenario for the construction of additional access roads and well pads is 37,512 acres. The anticipated 433 miles of additional geophysical survey line would adversely influence approximately 277,120 acres, if an operation of this magnitude were to occur at a given time. Although geophysical surveys would adversely influence 640 acres per mile during operations, based on the 0.5-mile zone either side of the line, the long-term area influenced would actually be restricted to the area of direct impact if the operations are properly stipulated because (1) significant changes in topography should not occur; (2) surface water flow should not be significantly impeded or altered; and (3) direct wildlife disturbance would cease when the area was vacated. Therefore, the long-term area of influence projected for the 433 miles of seismic line is the expected area of direct impact, 524 acres. The total additional long-term area of influence predicted in the status quo scenario is 38,036 acres (37,512 acres plus 524 acres), or about 6.6 percent of the preserve.

Area of Influence Analysis

The area of influence associated with existing oil and gas disturbance (38,458 acres), plus the projected area that may be influenced in the future (38,036 acres), totals 76,494 acres, or 13.3 percent of the preserve. A determination of whether or not this level of influence is acceptable had to made, based on a comparative analysis of the existing amount of oil and gas disturbance in the Bear Island and Corn Dance units.

Past and present oil and gas exploration and development in the Bear Island unit has resulted in the direct alteration of 183 acres of surface resources. The area adversely influenced by such development is approximately 12,900 acres, or 31.8 percent of the management unit. An evaluation of associated environmental consequences indicates that this level of development poses too great a risk to the preservation of resource values and the maintenance of ecosystem integrity.

Environmental consequences and risks at a 31.8 percent level of influence in the Bear Island unit include, but are not limited to,

(1) substantial alteration in surface hydrology by construction of numerous elevated roads and pads

(2) increased risk to the maintenance of water quality due to the relatively high potential for spills and leaks from petroleum operations

(3) potential adverse effects on the endangered Florida panther due to habitat fragmentation, increased noise, and human disturbance

(4) alteration of native vegetation communities leading to increased infusion of exotic plants

(5) visitor use conflicts

Oil and gas exploration and development in the Corn Dance unit has been largely limited to the Raccoon Point field. Approximately 222 acres of surface area has been directly impacted by construction. The calculated area of influence for the production field, access roads, and past geophysical lines is approximately 12,174 acres, or 10.5 percent of the management unit.

Impact of 10 Percent Influence Limit on Development

As previously shown, direct disturbance from oil and gas exploration and production operations to surface resources of the preserve is currently at about 1,117 acres. This acreage of existing direct impact is adversely influencing approximately 38,458 acres, or 6.7 percent of the preserve. By limiting the area influenced from oil and gas operations to a maximum of 10 percent, an additional 3.3 percent (18,956 acres) could be adversely influenced by future petroleum operations before reaching the area of influence limit. The National Park Service has determined, based on an evaluation of the area of influence associated with projected oil and gas exploration and development operations, that this influence would equate to approximately 143 acres of additional direct impact to the surface estate in the preserve, providing that no more than 10 percent of the preserve was "influenced" at any one time.

To put this in perspective, the 10 percent influence limit would currently allow for the development of two additional oil production fields slightly smaller than the Raccoon Point field, assuming that existing abandoned sites in the preserve were not reclaimed. Proper reclamation of abandoned access roads and pads would provide for equivalent development elsewhere, providing the 10 percent area of influence limit was not exceeded.

In terms of geophysical surveys, the 10 percent influence limit would currently allow for a 29.6-mile operation that would influence 18,956 acres (1 mile influences 640 acres). Following completion of the operation, the area influenced would decrease to the area directly impacted (approximately 36 acres). This reduction in the area influenced would allow for the conduct of a subsequent geophysical operation of approximately the same length. Limitations on additional operations would be based on this method. Any area of direct impact that was properly reclaimed would be deleted from the cumulative total of area influenced. It is important to reiterate that when the total area of influence related to unreclaimed operation sites and active operation sites reached the 10 percent limit, or 57,444 acres, no additional operations would be permitted.

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INTRODUCTION

Statement of the Problem

Big Cypress National Preserve was established by Public Law 93-440 in 1974 for the purpose of ensuring "the preservation, conservation and protection of the natural, scenic, hydrologic, floral and faunal, and recreational values of the Big Cypress Watershed in the State of Florida and to provide for the enhancement and public enjoyment thereof." The preserve encompasses approximately 570,000 acres in south Florida. The watershed consists of approximately 1,568,000 acres in Collier, Dade, and Monroe counties. Thus, the national preserve is of prime importance to the protection of natural freshwater flows that are essential to the south Florida ecosystem. In authorizing the preserve as a unit of the national park system, Congress directed the National Park Service to manage Big Cypress to ensure its natural and ecological integrity in perpetuity while providing for public use and enjoyment of its resources.

Plant communities in Big Cypress include temperate and tropical species. Patterns of plant cover are determined by the region's water flow regime. During the wet season, the preserve is characterized by an overland flow pattern. Gradually, the water level drops with the onset of the dry season when surface water flows are mainly through the strands and sloughs.

Big Cypress provides essential habitat for numerous rare, threatened, and endangered species compared to other protected areas of similar size in the United States. Ten wildlife species are federally listed as endangered, three wildlife species are listed as threatened, and 25 plant and wildlife species are being considered for listing (see tables 20 and 22 in the *Draft General Management Plan / Draft Environmental Impact Statement*).

A review of the House and Senate reports leading to passage of PL 93-440 identifies two fundamental resources in the preserve:

> ***Water*** – The natural flow of freshwater (that is, the watershed) is key to the survival of Everglades National Park as well as the integrity of the entire south Florida ecosystem.
>
> ***Natural values*** – As important as the watershed, the natural, scenic, floral, and faunal values are cited as being worthy of national recognition and protection on their own merit. Recreation is discussed along with the natural values because natural resources provide opportunities for recreational pursuits.

The act states that the preserve, as a unit of the national park system, is to be administered in a manner that will ensure its "natural and ecological integrity in perpetuity."

The act and its legislative history identify the following six categories of use that are allowed within the preserve (subject to reasonable regulation):

uses associated with "improved properties"
exercise of rights associated with oil and gas
hunting
fishing
trapping
certain Indian rights

The act further directs that rules and regulations necessary and appropriate to limit or control the following uses be developed:

motorized vehicles
exploration for and extraction of oil, gas, and other minerals

grazing
the draining or constructing of works or structures that alter natural watercourses
agriculture
hunting, fishing, and trapping
new construction
such other uses as may need to be limited or controlled

The regulations for oil and gas activities were promulgated on December 8, 1978. These regulations, found at 36 CFR 9B, control all activities associated with the exercise of nonfederal oil and gas rights within the national park system where access is on, across, or through lands administered by the federal government. The intent of the regulations, in general, is to ensure that all possible measures are taken to minimize the environmental impacts of oil and gas operations on the preserve's natural and cultural resources.

The National Park Service has no authority to acquire nonfederal oil and gas rights, unless a determination is made that mineral development would be detrimental to the purposes of the preserve. In complying with this congressional mandate, the National Park Service has to date acquired 93 percent of the 47,000 original tracts of private surface estate and less than 1 percent of the mineral rights, which were incidental to the purchase of the land tracts. This represents the largest land acquisition effort to date by the National Park Service at a cost of $179,013,497 to the federal government and $40,000,000 to the state of Florida. The vast majority of the oil and gas rights remain in private ownership. It is within this context that the protection of surface resources in association with oil and gas development becomes a complex issue. Therefore, the purpose of this minerals management plan is to identify where, when, and how oil and gas operations will occur in Big Cypress without detriment to the purposes of the preserve.

Relationship to the NPS Planning Process

This minerals management plan has been prepared concurrently with the *Draft General Management Plan / Draft Environmental Impact Statement*. The minerals management plan represents an implementing plan of the general management plan and specifies the strategies that the National Park Service will adopt to manage the development of nonfederal oil and gas rights in Big Cypress over the next 10 to 15 years.

Completed planning documents for the preserve consist of the *Statement for Management*, *Resource Management Plan*, and *Land Protection Plan*. All of these planning documents are pertinent to minerals management, as discussed below:

> ***Statement for Management*** – This planning document identifies oil and gas development as an influence on management of the preserve and defines the management objectives for Big Cypress. The objectives state that the National Park Service will "closely monitor all oil and gas exploration, production, and transportation activities within the preserve to ensure their compliance with all governing regulations and requirements and to ensure adequate restoration of water regimen and native plant and animal communities at the conclusion of a given activity."
>
> ***Resource Management Plan*** – This plan is being revised. It identifies 54 project statements for the preserve's natural and cultural resources. The plan's recommended actions for minerals management consist of projects (1) to preserve, conserve and protect the natural and cultural resources, as well as recreational values of the preserve; (2) to evaluate oil and gas rights for uses that might be detrimental to purposes of the preserve; (3) to regulate oil and gas operations as specified in 36 CFR 9B; and (4) to manage oil and gas exploration and production activities pursuant to PL 93-440.

Land Protection Plan – The *Land Protection Plan* identifies what lands or interests are required for federal ownership to achieve the purposes of the preserve. According to the plan, unregulated oil and gas activity is an incompatible use. However, in situations where access is on, across, or through federally owned or controlled land, oil and gas activity in the preserve is subject to regulation by 36 CFR 9B. These regulations are designed to minimize or avoid damage to natural, cultural, and recreational resources. This is to be accomplished by such measures as avoiding vegetation communities and cultural sites identified as important resource areas, restricting access on support roads, and requiring directional drilling to protect important resource areas. Therefore, the *Land Protection Plan* does not recommend acquiring nonfederal oil and gas rights. However, the establishing legislation authorizes acquisition if oil and gas activities would be detrimental to the preserve and its resources. This would be determined by examining whether oil and gas operations would be incompatible with important resource values and management objectives.

Land Classification and Management

Management Zones. A management zoning strategy has been developed for Big Cypress to indicate the management emphasis for specific lands and waters within the preserve. The management zones take into account important resources, development, environmental constraints, legal mandates, and other factors. Most of the preserve will necessarily be managed as a natural zone to ensure the protection of important resource areas, and relatively small areas will be zoned for cultural resource management, NPS development, and special uses. The natural zone and the petroleum development subzone are described below.

Natural Zone – Lands and waters in the natural zone will be managed to conserve natural resources and processes while accommodating uses and experiences that do not adversely affect the ecological integrity of the area. The natural zone is subdivided into the important natural resource areas subzone; special concern subzones for the Florida panther, red-cockaded woodpecker, Cape Sable seaside sparrow, and bald eagle; and the natural environment subzone. In addition the petroleum development subzone is included because areas occupied by oil and gas facilities would eventually be reclaimed and restored to a natural condition.

Petroleum Development Subzone – Preserve lands currently used for oil and gas operations (including oil pads, pipelines, and roads maintained by petroleum companies) are classified as part of the petroleum development subzone. As oil and gas activities continue in the preserve, additional areas will be added to this subzone. Although most of the lands in this subzone will have long-term occupancy (40 to 80 years), all will eventually be reclaimed and returned to natural conditions. Special precautions would be taken during reclamation to avoid disturbance to significant archeological resources. Total acreage now in the petroleum development subzone is 259 acres. In addition to lands in this subzone, an estimated 858 acres (474 miles) of unreclaimed geophysical lines also occur within the preserve.

Important Resource Areas. As a tool for managing the preserve's oil and gas review and permitting process, the National Park Service has identified and evaluated important resource areas within Big Cypress. This effort was initiated with the development of a sensitive resource areas map, which provided guidance to both the National Park Service and the petroleum industry in assessing the potential impacts of mineral exploration, production, and access. In identifying important resource areas, a variety of federal and state laws, policies, and regulations pertinent to environmental protection were reviewed. Based on this review, and a refinement of the sensitive resource areas map, criteria for individual important resource areas were developed. These criteria are as follows:

superior examples of the natural, scenic, hydrologic, floral, faunal, and recreational values for which the preserve was established

areas essential for maintaining water flow and quality to protect the ecological integrity of the preserve and Everglades National Park

habitat necessary for the continued survival of federally recognized threatened or endangered species of plants and wildlife

native American cultural sites, or important historic or archeological resources

The important resources are described below. These descriptions may be modified as a result of new information or conditions.

Cypress strands / mixed-hardwood swamps / sloughs and cypress domes – Strands, swamps, and sloughs are the major corridors of water flow in Big Cypress and are equally important to the Everglades ecosystem. Any interruption of this flow could have widespread adverse effects in both Big Cypress and Everglades. Strands, swamps, and sloughs also contain numerous rare and protected plants; species of concern include epiphytes, certain ferns, and rare trees (see "Affected Environment" section). This resource type also includes cypress domes, which provide pockets of permanent water and wildlife habitat similar to cypress strands.

Marshes – Marshes also have long hydroperiods, and any major alteration of water flow through this community could adversely affect both Big Cypress and Everglades. Marshes provide essential habitat for wading birds, including feeding habitat for the endangered wood stork, and the endangered Cape Sable seaside sparrow.

Hardwood hammocks – Hammocks are small tree-islands scattered throughout the preserve. Unlike other vegetation types in Big Cypress, hammocks are rarely flooded and tend to resist burning. They contain the majority of archeological sites known in the preserve. Many plant species in hammocks are rare, threatened, or endangered, ranging from small epiphytes to large trees. Wildlife species using hammocks include the state-protected *Liguus* tree snails and the federally listed endangered Florida panther.

Old-growth pinelands – Old-growth pinelands have never been logged. This forest type was once predominant throughout the southern coastal plain, but old-growth stands have been severely reduced by logging, development, and other land uses. In Big Cypress the old-growth pinelands are collectively among the largest such vegetative associations remaining in south Florida. Old-growth stands are essential habitat for the endangered red-cockaded woodpecker.

Mangrove forests – Mangrove forests help mitigate the destructive power of storm waves and contribute to estuarine food chains. They are also important nurseries and spawning grounds for numerous estuarine and marine species. In addition mangroves provide essential habitat for the manatee, American crocodile, and other protected species.

Red-cockaded woodpecker colonies – The red-cockaded woodpecker is a federal endangered species. There are an estimated 40 colonies in the preserve, the largest concentration known south of Lake Okeechobee.

Cape Sable seaside sparrow habitat – Big Cypress is one of three remaining population centers for the Cape Sable seaside sparrow, a federal endangered species. The Cape Sable sparrow only occupies seasonally flooded, freshwater marshes. The estimated 3,000 birds in Big Cypress represent about half of the known population.

Bald eagle nests – Three active bald eagle nesting sites are within the preserve. The bald eagle is an endangered species.

Known Florida panther areas – The Florida panther is under extreme risk of extinction and is federally protected as an endangered species. Survey work within the last five years has documented that panthers use virtually the entire preserve. Portions of the preserve where panther sign or radio-tracked panthers have been consistently found have been identified and mapped.

Miccosukee Indian cultural sites – Eleven Indian villages are located along US 41 and the Loop Road. Most of the 150 individuals who live in Big Cypress are independent Miccosukee Indians who do not belong to the federally recognized tribe and who do not choose to live on reservation land. As provided in the establishing legislation, Miccosukees and Seminoles may collect traditional subsistence materials and continue their religious practices in the preserve, subject to reasonable regulations. Ceremonial sites are regarded as important resource areas, but they are not shown on maps to ensure privacy and prevent vandalism.

Archeological sites – To date 395 sites have been found within the preserve. These sites may contain valuable information on past occupations of the area by prehistoric people. Sites are protected under the National Historic Preservation Act of 1966, as amended, and the Archeological Resource Protection Act of 1979. The sites are not shown on maps to prevent vandalism.

Land and Minerals Ownership. Big Cypress National Preserve encompasses 574,440 acres. As of 1989, approximately 531,131 acres have been acquired in fee by the federal government for administration by the National Park Service. Nonfederal landownership within the preserve amounts to approximately 40,852 acres. This ownership is comprised of four categories: state (school board) – 12,235 acres; state and county (roads) – 1,983 acres; Dade County Port Authority – 23,481 acres; and private – 3,153 acres.

Federal mineral ownership in Big Cypress is extremely rare. As noted, land acquisition was subject to landowners retaining oil and gas rights and any third-party oil, gas, and mineral rights of record. The establishing act for the preserve prohibits the acquisition of oil and gas rights without the owner's consent, except in cases where the exercise of these rights would be detrimental to the purposes of the preserve. Accordingly, the following reservation was used for condemnation actions to acquire lands:

> The fee simple title, excepting and reserving oil and gas rights in the owner of the fee, and subject to existing easements for public roads and highways . . . and further subject to oil, gas, and mineral rights in third parties, if any, as are excepted, reserved or conveyed in prior instruments of record.

However, federal mineral rights may arise in Big Cypress by one of three situations. First, oil and gas rights not retained by landowners in the early phases of land acquisition. Second, the purchase of 720 acres by the Nature Conservancy in a tax sale, and which were conveyed to the federal government. Third, the purchase of 141,600 acres by the state of Florida and quitclaimed to the federal government. This conveyance was subject to an agreement between the United States and the state of Florida. In acquiring these lands, the state also acquired oil and gas rights held by the landowners, subject to any outstanding third-party rights of record, and the terms and conditions specified in the quitclaims and a supplemental agreement regarding the preserve. The quitclaim deeds (nos. 25940, 25941, and 25942 of October 24, 1978) state that the grantor quitclaimed to the United States all rights, title, and interests in the lands conveyed. The supplemental agreement, dated October 24, 1978, states in part that the United States should reserve a royalty for the state's Board of Trustees on any oil, gas, phosphate, or other minerals produced from the lands conveyed. In summary, the terms and conditions of the quitclaims and supplemental agreement indicate that oil, gas, and mineral rights were conveyed to the United States by the state, if these rights were acquired by the state when it acquired lands in Big Cypress. The conveyance is subject to a royalty on behalf of the state if minerals are produced in the future. At present, the cost of title research to identify federal mineral ownership is considered prohibitive.

PLAN OF OPERATIONS

The exercise of nonfederal oil and gas rights within units of the national park system is governed by the NPS regulations for minerals management in 36 CFR 9B – "Non-federal Oil and Gas Rights." The regulations apply whenever access to the site of activity is on, across, or through federally owned or controlled lands. Operations, as defined, include all activities associated with oil and gas exploration and development. Examples of such activities include, but are not limited to, surveying, seismic exploration, development, production, on-site storage, transport or processing of petroleum, construction of pipelines, and use of approved access roads.

The permitting process for nonfederal oil and gas activities in Big Cypress is a complex sequence of procedures. Operators must file a plan of operations with the preserve superintendent, and the plan must be approved by the regional director before work commences. The plan of operations describes all proposed operations for nonfederal oil and gas exploration, production, development, and required access. As a management tool, the plan provides a means for analyzing how proposed activities would affect preservation, use, and management of preserve resources. The specifics of the required decision-making procedures for plans of operations are in the following discussion. Citations are provided from 36 CFR 9B, as appropriate.

Informational Requirements

General Descriptive Information. The operator is required by 36 CFR 9B to submit the following information in a proposed plan of operations:

- the name of the national park system unit and specific area within the unit in which the operation is proposed
- the names and legal addresses of the following persons: the operator, the owner(s), and the lessee(s)
- the name of the designated agent (person with authority to act for operator), and the locations and telephone numbers where the agent can be reached
- the designated field representative (field contact with authority to act for operator), and the locations and telephone numbers where the representative can be reached
- a copy of the lease, deed, designation of operator, or assignment of rights upon which the operator's right to conduct operations is based
- a certified title abstract to show the operator has the right to conduct mineral operations
- a description of the general type of operations proposed, including a brief description of whether the proposed plan covers a particular phase of development or a comprehensive proposal (a table could be provided to specifically indicate developments under the initial phase and those developments proposed under subsequent phases)

- maps (1:24,000 scale USGS quadrangles) showing the location of the proposed operations, and existing and proposed roads and trails

- a legal land description of the perimeter of the area where the operator has the right to conduct operations

- the name of drainages as shown on the USGS map

- the proposed route(s) of access (whether by existing road, new road, water, etc.); existing roads and trails that are to be used are to be shown on the USGS quad by using a dashed line (- - - -) for existing routes and a dotted line (• • • •) for a proposed new route

- improvements or earthwork proposed for existing roads and volumes of material from fill areas; for proposed new roads the length, roadbed width, average width of total disturbance, volume from fill areas, and total area of disturbance are to be provided

- the proposed method of transportation to and from the area of proposed operation; types of vehicles specified by make and model, tracked or wheeled, weight, any modifications made

- equipment to be transported

- proposed daily or seasonal dates of access: first trip in, last trip out, and number of trips anticipated

- all water sources and well sites necessary for operations, including the following information:

  water source intake subsystem, including source development and transmission facilities

  water treatment and/or production water subsystem, including the type of treatment as a function of quality and quantity of intake water

  final discharge subsystem, including quantity and quality of discharged water

  (Note: No operator may use water from within a national park system unit to conduct operations without written authorization from the regional director (9.35). Specifically, water use can only be authorized in one of two mutually exclusive situations: (1) The operator holds a water right claim superior to the claim of the United States; or (2) the claim of the United States is superior to that of the operator, in which case the operator must demonstrate that use or removal of the water will not damage the unit's resources.)

- a map of the proposed area of operations to describe the amount and extent of past and present development in the area of operations and a description of the development expected in the future, including the following information:

  the location of existing and proposed access roads or routes to and from the well site and/or area operations

  scale (horizontal and vertical)

  natural features (e.g., vegetation communities and drainages)

  existing surface disturbances and boundaries of proposed surface disturbances areas previously reclaimed

location of proposed drilling

location of all surface facilities

the well site layout

sources of construction materials (e.g., fill material)

surface transportation

- the name, type, and a short description of equipment and methods to be used for all drilling operations
- the name, type, and a short description of equipment to be used for abandonment of the well, including depths and types of plugs and fills
- the equipment and methods to be used to transport all waters used in or produced by operations
- a statement whether this plan is for the continuation of previous operations or new operations
- estimated timetables for beginning and completing each phase of development proposed, and for the overall proposal
- the identification of the energy source(s) – on-site generators, off-site facilities, etc. – with a description of the layout of any transmission line system, current and voltage requirements, and safety systems
- a description of the use and handling of chemicals and the disposal of waste and hazardous materials
- fuel requirements, transportation and storage facilities, and methods and sites for disposal of waste fuel and oil
- all structures necessary for the operation and their purpose, methods of erecting structures, and materials used, along with sources and transportation needs
- steps to be taken to comply with all operating standards (36 CFR 9B); all applicable federal, state, and local laws and regulations
- the geologic name of the surface formation, the proposed drilling depths, and estimated tops of important geologic markers, and the nature and extent of the known deposit or reservoir to be produced
- the relationship between the proposed plan of operations and the current *Statement for Management* and other pertinent planning documents
- activities to control, minimize, or prevent damage to the recreational, biological, scientific, cultural, and scenic resources
- oil and hazardous materials contingency plans

- a statement of intent to fully comply with the terms and conditions of the 10 percent area of influence stipulation, the Bear Island stipulation, the important resource area protection stipulation, and operational stipulations

- a statement of intent to fully comply with the standards in 36 CFR 9.42-46, which relate to the following:

  well records and reports, plots and maps, samples, tests, and surveys (9.42)

  required precautions where high pressures are likely (9.43)

  open flows and control of "wild" wells (9.44)

  handling of wastes (9.45)

  accidents and fires (9.46)

Environmental Report. As part of the plan of operations, section 36 CFR 9.36(a)(16) requires that the natural, cultural, social, and economic environments to be affected by operations be described. Since this information is the basis for preparing an environmental analysis by the National Park Service, it is important that each element be addressed in detail. The following discussion of these elements is offered to assist in the preparation of this section of a plan of operations.

- natural and cultural environment of the area affected by operations – thoroughly describe the aquatic and terrestrial environments, including soils, water resources, water quality, floodplains and wetlands, topography, geology, watershed characteristics, vegetation, threatened or endangered species, fish and wildlife habitat, large mammal populations, aesthetics, cultural resources (historic/archeological sites), and recreational use

- operational environment of the area affected by operations – descriptions and maps for all wells of public record (water, abandoned, temporarily abandoned, disposal, production, and drilling wells) within a 2-mile radius of the proposed area of operations so that the impacts of the proposed activity on existing wells can be evaluated

- impacts of proposed operations on the existing environment – accurate and precise descriptions of how the operations would affect each of the items above, including both direct and indirect impacts to the preserve's natural environment (e.g., vegetation, fish and wildlife movement and migration patterns), cultural environment (historical and archeological resources), the human environment (e.g., recreation, noise, solitude, aesthetics, odor, visibility), and economic environment (e.g., visitor values); also because of NPS concerns for operational safety, an evaluation of whether proposed operations would in any way affect wells in existence within a 2-mile radius of the proposed area of operations (i.e., the potential for the blowout of an adjacent abandoned well, subsidence, or consideration of state spacing requirements)

- steps to be taken to ensure minimal surface disturbance – all measures, procedures, or stipulations to be used during the conduct of operations that would result in minimum surface disturbance

- mitigation techniques – an evaluation of all mitigating measures, including a discussion of the operations that mitigating measures can be applied in order to minimize adverse impacts to any of the values described above for the affected area; an evaluation of those operations that would cause some adverse impacts and that could not be mitigated;

descriptions of equipment and operational procedures that would be used to protect all surface and subsurface waters within and adjacent to the proposed area of operations

- methods for disposal of all wastes – the proposed methods of handling, storing, transporting, and disposing of all wastes, contaminating substances, and hazardous materials; identification of disposal locations; and if federal or state permits are required, information about procedures to be followed to secure the necessary permits

- alternative methods of conducting operations, their environmental effects, and their costs – possible alternatives that are technologically feasible to the operator, and a discussion of other feasible methods in terms of their costs and resultant environmental effects

- effects of actions taken to comply with the reclamation plan – the beneficial and adverse impacts of actions to provide for the safe movement of native wildlife, the reestablishment of native vegetation, the normal flow of surface and subsurface waters, and the return of the area to a condition that does not jeopardize visitor safety or public use of Big Cypress

Reclamation Requirements. A reclamation plan is also a required element of each proposed plan of operations. A reclamation plan must include the following:

- steps to be taken to comply with reclamation standards at 36 CFR 9.36(a)(11) and 36 CFR 9.36(a)(12)

- a breakdown of costs during all phases of reclamation during the conduct of and at the completion of proposed operations

- procedures for reclaiming the surface

- timing and phasing of reclamation

- benchmarks or standards to measure success of reclamation

Procedural Review of a Plan of Operations

Upon receiving a plan, the National Park Service conducts a completeness review to ensure that the plan meets the information requirements specified in section 9.36. The Park Service must determine whether additional information is required to verify the right to conduct proposed operations, analyze the proposal, or make recommendations to the regional director on plan approval or disapproval. When a plan is determined to be complete, it is submitted to the regional director for an environmental analysis. The National Park Service is required to invite public review and comment on a proposed plan of operations by publishing a notice of availability in the *Federal Register*.

The regional director's environmental analysis of the proposed plan should be completed within 60 days (section 9.37[b]). This analysis examines all information submitted to the National Park Service, evaluates the reclamation requirements, estimates bonding requirements, evaluates whether additional information is needed, assesses the environmental impacts, including cumulative effects, of the proposed operations, and determines whether an environmental impact statement is needed.

All plans of operations must meet four standards for approval by the National Park Service. First, the operations must be technologically feasible and implemented so as to minimize impacts on the environment and to ensure public health and safety (9.37[a][1]). Second, the operations must not constitute a nuisance or result in significant damage to federal lands in the vicinity of the activities, if the surface estate is not owned by the United States (9.37[a][2]). Third, operations on federal lands may neither interfere with preserve management nor result in significant damage to federally owned or controlled lands. In some cases this standard cannot be achieved. If not, and if plan denial would constitute a taking rather than a reasonable regulatory action, the regional director has two options. The mineral interest can be acquired, or the plan can be approved with operations conducted in a way to minimize damage to federally owned or controlled lands (9.37[a][3]). Fourth, the plan of operations must meet the information requirements specified in 9.36 (9.37[a][4]).

Based on the environmental analysis and the findings of the above standards, the regional director should decide whether to approve the plan, reject the plan, or consider it further. The operator must be notified by the National Park Service as to the decision or additional requirements, as specified below (9.37[b]):

(1) Notify the operator of plan approval or rejection and, if rejected, the reasons.

(2) Notify the operator of conditional plan approval, subject to specific mitigating measures.

(3) Notify the operator that additional modifications or information is needed prior to plan approval.

(4) Notify the operator that additional time (up to 30 days) is necessary for plan review, and the reasons why.

(5) Notify the operator that an environmental impact statement (EIS) is required and the plan cannot be considered for approval until 45 days after the EIS is prepared.

(6) Notify the operator that more time is needed for public review and analysis of comments on the proposed plan of operations.

Approval of a plan of operations by the National Park Service is conditional on the superintendent having access, as needed, to the site of operations. This facilitates monitoring by NPS staff to ensure compliance with the terms and conditions of an approved plan of operations. An approved plan is required for any operation in situations where access to the nonfederal mineral estate affects federally owned lands.

In response to unforeseen circumstances, both the regional director and the operator have the option to request supplementation or revision of an approved plan of operations (9.40). Again, the regional director must apply the plan approval standards and perform an environmental analysis. In some cases, modifications would be needed to avert significant damage to federally owned or controlled lands. If the modification was not implemented, the National Park Service would suspend operations until the problem was corrected. In all other cases, the regional director would provide a 60-day notice to the operator prior to implementing the modification.

According to the regulations, operators have the right to appeal any decision made by the superintendent or regional director (9.49). An operator must file a written statement of appeal within 30 days after receiving written notification of the NPS decision causing aggrievement. All appeals are reviewed by the National Park Service. Each appeal would go through a level of review, beginning with the superintendent. A review decision could ultimately be forwarded to the NPS director. While there is no specified timeline for evaluating and responding to appeals, they should be forwarded to the next NPS level of review, if necessary, within 30 days.

OIL AND GAS ENVIRONMENTAL REVIEW PROCEDURES

Details regarding agency environmental review procedures for proposed plans of operations can be found in "NPS Procedures Governing Non-Federal Oil and Gas, 36 CFR Part 9, Subpart B," which has been prepared by the Mining and Minerals Branch, Land Resources Division (NPS 1989b).

MONITORING OF OPERATIONS

The NPS organic act and the Big Cypress National Preserve establishing act provide the primary basis for regulating the exercise of nonfederal oil and gas rights in the preserve. The NPS regulations for managing these operations (36 CFR 9B) are predicated on the discretion of the superintendent to restrict and condition access to the site of activity. These regulations are applicable only where access is on, across, or through federally owned or controlled lands. The primary enforcement tools available to the National Park Service consist of the plan of operations and the bonding requirements. Approval of a plan of operations by the Park Service is expressly conditioned on the agency having reasonable access to the site of operations, as needed, to monitor the operations on a regular basis, and to ensure compliance with an approved plan of operations.

Preserve staff perform patrols to monitor oil and gas activities. An operator would be notified of any activity not in compliance with an approved plan of operations or in violation of 36 CFR Parts 1-7. A case incident record (form 10-343) is used to document the matter and allow for follow-up on subsequent patrols. During each patrol, access roads, pipelines, flowlines, and pad areas are inspected. The results of these inspections are recorded on form 10-343 as a monitoring record for future reference. These reports may be augmented by specific measurements and photographs, as necessary.

The National Park Service must ensure that the operator's conduct of operations does not conflict with laws for cultural resource protection. The degree to which the Park Service may exercise regulatory compliance and control depends on whether the United States owns the surface estate. The protection of natural resources will primarily rely on rules found at 36 CFR Parts 1-7. Operators must comply with the Antiquities Act where the surface estate is federally owned. This law and section 9.47 of the regulations prohibit the destruction or collection of, or harm to, objects of historical, archeological, or other cultural scientific importance. The regulations also have a measure for protecting unknown cultural resources discovered during the conduct of operations (9.47[b]). Known as the notification requirement, it is based on the NPS organic act (16 USC 1) and the National Historic Preservation Act, and it also applies to the nonfederal surface estate. The notification requirement is invoked when the operator discovers cultural or scientific resources that the operations, if not temporarily halted, would destroy or diminish. In such cases, the operator must immediately notify the superintendent and leave the discovery intact. This allows the National Park Service to determine whether the discovered resources merit acquisition either in place or after excavation.

The Archeological Resources Protection Act imposes severe criminal and civil penalties on persons who destroy archeological resources as defined in 43 CFR 7.3(a). Even though oil and gas operations may have incidental impacts on archeological resources, permits are not issued for activities that are not directly related to archeological resource excavation or removal. Thus, no permits are required of operators proposing mineral activities under an approved plan of operations or use of federally owned lands for access. In two situations, however, operators would be subject to the criminal and civil penalties of the Archeological Resources Protection Act. This would occur if the operations were conducted contrary to or without an approved plan of operations, or if they resulted in damage to archeological resources.

If the conduct of mineral activity authorized by an approved plan of operations is in violation of the regulation, the operator is subject to civil penalties. Those operators conducting mineral activity without an approved plan of operations are considered to be in trespass against the United States (9.51). In this instance, the National Park Service would request an injunction or temporary restraining order. All persons conducting mineral activity without an approved plan of operations would be subject to penalties for violating 36 CFR 1, as applicable. Violations of an approved plan of operations are not subject to penalty under 36 CFR 1.

Situations might arise where operations were being conducted contrary to an approved plan of operations, or where operations were in violation of cultural resource protection acts and 36 CFR Parts 1-7, as applicable. Such situations would specifically involve activities on preserve lands outside the area if operations and approved access routes, as well as activities in the preserve that are prohibited for all persons. In either case, the Park Service could select one of the following four options:

Option 1: Suspend or revoke the approval of the plan of operations – Where necessary, the National Park Service has the authority to suspend operations until the violation has been corrected. Plan suspension is both temporary and reversible. If an operator failed or refused to correct a violation, the National Park Service would consider revoking its approval of the plan of operations. The revocation of a plan approval is more severe because this action is irreversible and results in the forfeiture of the operator's bond. Whenever the National Park Service determined that an operator was conducting activities that represented an immediate threat to preserve resources, all operations must be halted immediately and plan approval suspended. If the violation did not constitute an immediate resource threat, the National Park Service would allow the operator 10 days to correct the problem. Plan approval would not be suspended if the violation was remedied within the 10-day period.

Option 2: Seek an injunction or temporary restraining order – Option 2 could be sought for operations proceeding without an approved plan of operations. It would also be applicable for cases where activities were conducted contrary to an approved plan, and the operator refused to comply with an NPS suspension order. An injunction or temporary restraining order is an order to cease immediately all activities listed in the complaint and involves the departmental solicitor and the U.S. Department of Justice.

Option 3: Seek payment for damages to preserve resources – Option 3 would allow the National Park Service to seek payment for damages that resulted from violations of the plan of operations. This process would begin with the preparation of a damage estimate, which would usually be based on the estimated cost of reclamation, although it could be adjusted to account for cost increases associated with performing reclamation work. An operator is liable for correcting all damages resulting from violations of an approved plan of operations.

Option 4: Attach the operator's bond – Option 4 would involve forfeiture of the operator's bond and recession of approval for a plan of operations. The purpose of bonding is to guarantee compliance with the regulations, operating stipulations, and conditions of an approved plan of operations. A bond is set to an amount equal to the estimated cost of reclamation.

As previously stated, operators have the right to appeal any decision made by the superintendent or regional director (9.49). An operator must file a written statement of appeal within 30 days after receiving written notification of the NPS decision causing aggrievement. All appeals are reviewed by the National Park Service. Each appeal would go through a level of review, beginning with the superintendent. A review decision could ultimately be forwarded to the NPS director. While there is no specified timeline for evaluating and responding to appeals, they should be forwarded to the next NPS level of review, if necessary, within 30 days.

STIPULATIONS

To achieve the intent of the regulations to protect the environment, the National Park Service has developed a set of stipulations for the various exploratory and operational phases of oil and gas development. These stipulations are necessary to protect natural and cultural resources in Big Cypress National Preserve. The authority to implement and enforce these stipulations is derived from 36 CFR 9B. The stipulations that would be used at Big Cypress include allowing no more than 10 percent of the preserve to be subject to influences from oil and gas exploration and development activities at any one time, permitting future activity in the Bear Island unit only on existing roads and pads, protecting important resource areas, and minimizing impacts during various phases of oil and gas development.

Ten Percent Area of Influence Stipulation

At any one time only 10 percent of the preserve could be subject to the influences of oil and gas exploration and development activities.

Bear Island Stipulation

Future oil and gas operations in the Bear Island unit would be permitted only on existing roads and pads so as to result in no additional surface disturbance. On-site reclamation, normally required under 36 CFR 9B, would be waived in this unit to allow access for subsequent operators to their mineral interests. However, one-to-one mitigation, where disturbed lands in other areas of the preserve would be reclaimed in lieu of reclamation in Bear Island, would be permitted. The result would be no net loss of resources.

Important Resource Area Protection Stipulation

Important resource areas include vegetation and landform resources such as cypress strands / mixed-hardwood swamps / sloughs and cypress domes, marshes, hardwood hammocks, old-growth pinelands, and mangrove forests; wildlife resources such as red-cockaded woodpecker colonies, Cape Sable seaside sparrow habitat, active bald eagle nesting sites, and known Florida panther areas; and cultural resources such as archeological sites and Miccosukee Indian cultural sites. This stipulation will specify that no surface use or occupancy be permitted for the placement of pads, roads, pipelines, and geophysical operations in or on cultural sites or vegetation communities identified as important resource areas. This stipulation will not apply to casual or other uses that would not significantly disturb surface resources, such as geophysical surveys conducted by foot or nonmotorized ground methods.

Operational Stipulations

The following operational stipulations are tailored to the specific phases of oil and gas exploration and development. These stipulations are designed to minimize the impacts of oil and gas operations.

Geophysical Operations. The following stipulations would be applied to all geophysical operations:

(1) The operator, in conducting activities approved in a plan of operations, must comply with all federal, state, and local laws, regulations, and ordinances applicable to the area or activities covered by the plan of operations, and the operator must provide an affidavit specifying such compliance.

(2) An approval of a plan of operations for geophysical survey work does not in any way constitute an approval of any subsequent actions for exploration, removal, or development of oil and gas resources in the area of operations.

(3) The operator must exercise diligence in protecting from damage the land and property of the United States covered by and used in connection with a plan of operations. Furthermore, the operator must pay for any damage resulting from the violation of the terms of a plan of operations or any law or regulation applicable to the National Park Service by the operator, his agents, or employees, or through negligence of the operator, his agents, or employees, when acting within the scope of their employment.

(4) The operator must provide the superintendent with the grants of permission from the mineral owners to access such property. The operator must also provide the superintendent a listing of those mineral owners not granting access permission for the current proposed operation.

(5) Big Cypress National Preserve headquarters must be contacted prior to entering the unit to conduct operations.

(6) The operator must take necessary precautions to prevent and suppress wildland fires. In connection with the operations as approved by the National Park Service, fire prevention and suppression equipment as required by the Park Service must be provided. During times of high or extreme fire danger, operations may be temporarily suspended at the discretion of the superintendent.

(7) All fire safety measures and orders issued by the Big Cypress fire management officer or superintendent during high fire danger periods are to be complied with.

(8) Geophysical operations are to be located or scheduled to avoid

- known archeological sites and apparent archeological sites, when observed – the National Park Service must be notified within 24 hours if possible archeological sites are observed
- major recreational use and hunting periods
- periods of extreme or high fire danger
- known bald eagle nesting sites – the National Park Service must be notified immediately if apparent nesting sites are observed
- known red-cockaded woodpecker colonies – the National Park Service must be notified immediately if apparent colonies are observed
- buffer zones recommended by the National Park Service or resource experts to minimize disturbance to sensitive wildlife

- seasons, periods, or times of critical wildlife use by threatened or endangered species, such as nesting, breeding, and birthing periods
- periods of high precipitation and/or with standing surface water (the wet season – normally May through December)

(9) Geophysical operations are not to be allowed during the bald eagle nesting season in areas identified as having known active bald eagle nests. If an active bald eagle nest is discovered within 1.25 miles of a seismic line, activity will be halted during the nesting season within a 1.25-mile radius of the nest.

(10) Any disturbance to pre-identified habitats of threatened or endangered species, bird rookeries, and any active nesting sites are to be avoided.

(11) Geophysical operations are not to be permitted within 500 feet of every cavity tree in a red-cockaded woodpecker colony during the breeding and nesting season.

(12) All cultural, historic, and archeological sites must be avoided.

(13) Archeologists approved by the National Park Service must accompany the line survey crew to identify and avoid cultural sites.

(14) Areas considered to be extremely sensitive to environmental degradation are to be accessed only by foot.

(15) NPS observers are to oversee the surveying, drilling, and reclamation phases of geophysical operations within the preserve. These observers are to advise the operator as to the type of vehicles to be used and the adequacy of reclamation on an area by area and on a day-to-day basis. Any conflicts arising from such specific, daily consultation are to be mediated by the superintendent.

(16) Use of motorized vehicles must comply with the standards established for use by preserve visitors. During all phases of operations the use of buggies and ATVs is to be restricted to roads and designated ORV trails. Existing trails are to be used to minimize new surface disturbance.

(17) The operator must use foot access or nonmotorized ground access methods to transport personnel, geophones, cable, and other equipment in the Loop and Deep Lake units, across areas identified as important resource areas, or in other undisturbed areas to avoid degradation of wildlife habitat important to the Florida panther. In such areas, the use of hand-portable drills is required.

(18) During the survey phase all helicopter landing zones are to be selected to minimize the number of trees to be cut. All helicopter operations must be in compliance with FAA standards for the transport of personnel, equipment, and normal operating procedures.

(19) Helicopter landing zones are to be certified by NPS staff.

(20) Vegetation cutting and trimming are to be allowed for line-of-sight surveys only, and no cutting of vegetation is allowed below the height or beyond the width of 36 inches. No cypress trees of any size are to be cut or trimmed. No vegetation cutting or trimming is to occur in important resource areas.

(21) No vegetation is to be "bulldozed" as a result of vehicle operation; vegetation must be capable of returning to an undisturbed condition following vehicle passage.

(22) Hand-transported or airlifted drilling units are to be used in any area where wheeled, trailered, or other nonportable equipment cannot traverse.

(23) Survey lines are to be gapped across sections where a legally necessary party has not given permission for access; such areas are to be designated on maps provided by the operator.

(24) No shot holes are to be drilled in important resource areas.

(25) All drilling operations are to occur within corridors identified on maps by survey crews; a 500-foot lateral offset is permitted to avoid sensitive/impassable habitats.

(26) During the shot hole drilling phase, the use of a drilling bucket, or comparable device, to collect drill cuttings is required. Cuttings are to be used to backfill shot holes during reclamation. Excess shot hole cuttings in areas of acidic soils are to be removed and disposed of off-site. The operator, in consultation of the National Park Service, must identify acidic soil areas.

(27) Charges are to be loaded or stored in accordance with the state fire marshall's regulations.

(28) Magazines are to be secured in the field in accordance with the state fire marshall's regulations.

(29) Area closures are to be posted in accordance with 36 CFR 1.5.

(30) No geophones/cables are to be stored/staged on preserve lands without NPS approval.

(31) Bentonite bags stored in staging areas are to be sufficiently covered and waterproofed to prevent concretion as a result of rain, flooding, or dew.

(32) Drip pans are to be provided under fuel containers and vehicle refueling centers; fuels are to be elevated; fire safety and cleanup equipment are to be on site.

(33) The temporary mixing zone (measured for 30 days) for turbidity is not to extend for more than 20 feet downstream or radially from the hole or vehicle traverse corridor (turbidity = 29 NTU above background level); containment devices are to be used as necessary, or operations are to temporarily cease to prevent turbidity in excess of 29 NTUs above background levels outside the mixing zones; operations are not to resume unless appropriate measures have been taken to prevent a reoccurrence of turbidity violations; the lead drill crew observer is to collect samples to be given to Big Cypress hydrologist to determine the background turbidity level.

(34) Florida water quality standards are to be adhered to at all times.

(35) Signs are to be erected on major highways to caution drivers about the presence of mining-related traffic (e.g., "Trucks Entering Highway").

(36) All shot holes must be backfilled with drill cuttings and native materials; bentonite is not to be used during plugging and reclamation of shot holes. Reclamation must be completed to the satisfaction of the superintendent.

(37) The "cap" of native soils and vegetation is to be replaced as the top component of the hole during backfilling so as to resemble natural soil and vegetative conditions to the maximum extent possible.

(38) Non-acidic drill hole cuttings are to be dispersed at the ratio of 0.5 cubic foot per 50 square feet around each hole so that any elevation change is limited to 0.25 inch.

(39) All trash and debris resulting from the operations, including plastic flagging, stakes, and other temporary markers put in place by the operator, must be removed from the preserve.

(40) All wires and detonation caps are to be removed from the preserve.

(41) Marred or wounded standing trees are to be treated with a commercially available, non-toxic pruning paint or wound coating.

(42) Within 14 days following completion of the recording, cleanup crews are to level all rutting and depressions, such that natural grades are restored in a manner to maximize restoration of preexisting conditions.

(43) Ruts and vehicle tracks are to be restored to original contour conditions, and reclamation is to be completed to the satisfaction of the superintendent.

(44) Turbidity screens are to be used in areas of standing or flowing water to control turbidity during reclamation.

(45) Reclamation is to be conducted on a contemporary basis with the operations, or no later than 30 days following the completion of operations, excepting inclement weather conditions. Preserve headquarters must be contacted upon completion of reclamation work by telephoning (813) 695-2000 during normal business hours.

Drilling and Production. The following stipulations would be applied to drilling and production activities:

(1) Existing pads and access roads are to be used for operations in lieu of creating new surface disturbance to develop oil and gas facilities.

(2) Access roads are to be planned so as to cross as few vegetation communities as possible.

(3) Access roads are to follow existing trails where possible.

(4) Culverts, bridges, or other structures are to be used to ensure the free flow of water when drainage ways are intersected.

(5) In wetland community types roads are to be designed with drainage structures to prevent the disruption of surface water flows. A culverting plan based on hydrologic considerations (e.g., hydroperiod, average depth, surface flow patterns) would be prepared to determine the number, size, and location of drainage structures to be used, surface water flow patterns, hydroperiod, average depth of water in the area being traversed by the access road, and approximate flow rate.

(6) Access roads are to follow water flow to the greatest extent possible to avoid intersection of water drainage ways.

(7) Access road corridors are to be no wider than 30 feet (allowable width would increase at turnout points, if utilized).

(8) Access roads are to be properly signed to indicate maximum speed, turnouts, ORV crossings, curves, etc.

(9) All construction activities associated with oil and gas development are to occur only during the dry season (November through May).

(10) The use of approved access routes to the site of operations is to be limited to the operator's authorized personnel and official government personnel conducting monitoring and compliance inspections in accordance with the plan of operations.

(11) Work crews are prohibited from carrying firearms while working in the preserve.

(12) No dogs are permitted at residential camps or the site of operations.

(13) A hurricane evacuation plan must be submitted.

(14) During high water periods, oil operators are subject to regulation as needed.

(15) Drilling and production operations are not allowed during the bald eagle nesting season in areas identified as having known active bald eagle nests. If an active bald eagle nest is discovered within 1.25 miles of an operation, activity within a 1.25-mile radius of the nest is to be halted during the nesting season.

(16) The pad design is to conform with the natural features of the vegetation community and to promote natural water flow; the pad is to be situated so as not to interfere with the natural water flow.

(17) Four well casings are required for protection of surface and groundwater supplies.

(18) Care must be taken to protect surface and subsurface water from contamination, especially during the drilling phase when large amounts of produced water, drilling fluids, drilling muds, and oil may be in contact with the surface and subsurface waters. Water monitoring stations or wells are to be installed upgradient and downgradient of the well pad to test for surface and subsurface water quality. The upgradient station(s) are to characterize existing water quality for preexisting conditions. The number of stations and their location would be determined specifically for each proposed plan of operations.

The following parameters would be sampled to monitor surface and subsurface water quality impacts related to oil and gas development:

alkalinity
aluminum
barium
benzene
chlorides
ligno sulfate
oil and grease
pH

sodium
specific conductivity
temperature
toluene
turbidity
xylene

These indicator parameters would be sampled monthly for the upgradient station(s) at least six months prior to drilling operations and after plan approval, and sampling would continue during drilling operations. These same parameters would be sampled twice a month at the downgradient station(s) coinciding with drilling operations, and sampling would continue until site restoration was completed.

If during the sampling period anomalies appeared in the indicator parameters, additional testing for the following parameters would be required on a frequency to be determined as conditions warrant:

biochemical oxygen demand (BOD)
calcium
dissolved oxygen (DO)
magnesium
metals
sulfates
total dissolved solids (TDS)

If surface and subsurface water contamination was observed, operations would cease, monitoring would continue until restoration was completed, and cleanup would be initiated.

In order to make the data collected from this monitoring project most useful to management and for monitoring long-term trends, a standardized format would be used to record, list, and display all data.

A report presenting the results of the water quality monitoring for each station would be submitted to the Big Cypress superintendent upon completion of each analysis (monthly for upgradient stations; bi-monthly for downgradient stations). This report would consist of the following components:

- a summary table that defines sample station, date of collection, and value for each parameter
- a graphic comparison of the differences between sites for each parameter (each graph should represent one parameter for N sites; all data should be plotted as bar graphs, and each graph should give the date, site, and specific parameter)
- a narrative comparing the results with the Florida water quality standards, as defined in chapter 17 of the Florida Administrative Code, and describing anomalies that occur between each site

An annual report presenting the results of the water quality monitoring for each station would be submitted to the Big Cypress superintendent. This report would consist of the following:

- a summary table that defines the sample station, dates of collection, and value for each parameter

- a yearly graphic comparison of differences between sites for each parameter (each graph should represent one parameter for N sites; all data should be graphically plotted, with each graph showing the maximum, minimum, median, geometric mean, 25th and 75th percentiles [bar and whiskers])
- a narrative comparing the results with the Florida water quality standards (as defined in chapter 17 of the Florida Administrative Code) and a description of anomalies that occur between each site, and seasonal trends as they affect the anomalies

(19) All produced salt water must be returned underground via injection wells. Under no conditions whatsoever may salt water be released on the ground surface. Underground disposal of produced salt water is limited to zones of lesser water quality than the produced water.

(20) A dike capable of containing at least 1.5 times the volume of crude stored on the site must be constructed around each well.

(21) All fill materials for access roads, pads, and dikes are to be composed of native limestone from existing quarries (where appropriate, materials should be from existing disturbed sites within the preserve boundary)

(22) Automatic well shutdown devices are to be used to shut off oil flows in response to pressure changes.

(23) Oil and gas wells must have fail-safe, ball-type, remote control subsurface safety valves.

(24) Blowout preventer assemblies must be designed to preclude "gushers" and leaks.

(25) Continuous gas monitoring devices are to be installed in all enclosed areas to decrease the likelihood of fire.

(26) Transportation of oil by tanker truck is to be limited to 500 barrels for the purpose of production testing. All other transport of oil is limited to a pipeline.

(27) Flowlines are to be located within the access road corridors and are to be bermed.

(28) Pipelines are to cross over rather than under canals in order to avoid creating low spots in the flowlines that could trap water.

(29) Pipelines at ORV crossings must be buried.

(30) Buried flow lines are to be protected against external corrosion by plastic coatings and cathodic protection devices; lines are to be periodically dug up at selected points and examined by X ray or inspected internally.

(31) Automatic shut-off valves are to be activated whenever a significant pressure drop is detected in a pipeline. Tests indicate that they will come into action before 10 barrels of oil are lost. Although a minor leak would not activate the shut-off valve, only a relatively small amount of oil would be released before it would be discovered in the course of a routine inspection.

(32) Flowlines, pipelines, and other production equipment are to be tested annually for deterioration.

(33) A spill prevention control and counter-measure plan must be prepared and implemented, in compliance with the requirements at 40 CFR Part 112.

(34) Oil spill cleanup equipment (pumps, skimmers, and absorbents) and emergency personnel must be on hand and available for immediate mobilization.

(35) The process of reclamation begins with the documentation of pre-disturbance conditions as a baseline, continues through operations, and requires certain follow-up actions after reclamation actions have been completed. Stipulations relating to each of these phases are included in tables C–1, C–2, and C–3. In addition the following general stipulations apply:

- The control of exotic species must be considered throughout the reclamation of disturbed sites. Steps are to be taken to prevent the colonization of exotic species at abandoned oil and gas sites as well as sites with active operations. Any method used for the control of exotic species must be approved prior to its application. The following stipulations apply:

  Prevent or control exotic species colonization for a period of not less than five (5) years.

  Utilize various methodologies for control of exotics (e.g., fire, herbicides, physical removal) as appropriate, with prior consultation with preserve staff and approval.

  Control the following exotic species: casurina, melaleuca, schinus, neyrahdia, and others that may be identified by the preserve staff.

- All aboveground structures, equipment, and roads used for the operations are to be removed, unless otherwise authorized by the National Park Service
- All debris resulting from the operations is to be removed.
- Any toxic or contaminating substances are to be removed or neutralized.
- All wells (i.e., nonproductive, water) are to be plugged and capped.
- Dump holes, reserve pits, ditches, and other excavations are to be filled.

Table C–1: Pre-Disturbance Monitoring Stipulations

Step 1 – Photograph the Proposed Location and Surrounding Area	**Step 2 – Establish Ground Elevations and Associated Hydrology**	**Step 3 – Collect Data Pertaining to Soils**
Document condition of the site	Develop contour map of entire site with 2-inch contours	Collect soil samples at several locations and depths
Document plant community type	At a minimum measure elevations at the set points used for photos	Analyze samples to determine substrate characteristics and nutrient levels
Document presence of exotic species	Collect hydrologic data	Test following parameters: NO_3-N, NH_4-N, Cl, Ca, Na, Mg, PO_4-P, pH, K, SC; percentages of silt, sand, clay; oil and grease; organic matter; and alkalinity
Document presence of threatened or endangered species		
Document existing disturbances		
Take photos from set points		
Take aerial photos to determine percentage of vegetation cover		

Table C–2: Reclamation Stipulations for Oil and Gas Drilling and Production Operations

General Guidelines	Reclamation during Site Development	Reclamation during Drilling and Production	Reclamation after Drilling/Production
Begin reclamation within 6 months after abandonment of operations unless otherwise stipulated. Remove fill from all pads and access roads, and apply a substrate suitable for revegetation to restore the elevation and hydroperiod of the site to natural conditions. Begin revegetation activities (i.e., planting, reseeding, mulching) within 1 year after abandonment of operations. Complete reclamation within 5 years. Restore native vegetation to at least 80 percent areal coverage and species composition, and sustain for at least 3 successive growing seasons before reclamation can be considered complete. Allow a 20 percent variance in substrate characteristics. Maintain natural drainage patterns by installing culverts during site construction; remove all structures and obstructions to flow after abandonment of operations.	Step 1 – Restore substrate and elevation: stockpile soils where possible use marls as donor material at other restoration sites Step 2 – Restore natural hydroperiod: ensure identification of water flow channels and patterns maintain proper drainage by using culverts install permanent staff gauges in each surrounding ecological zone take monthly readings to determine hydroperiod trends use sediment booms and screens Step 3 – Revegetate: remove and transplant threatened and endangered species to like habitat collect seeds/seedlings from native sources stockpile soils to be used as seed bank or for use as donor material in restoration of like habitat	Step 1 – Restore substrate and elevation: restore areas not needed for oil and gas activity reclaim areas no longer in use (to begin within 6 months after abandonment) Step 2 – Preserve natural hydroperiod and water quality: maintain natural hydroperiod and water quality of adjacent wetlands (i.e., proper culverting) monitor hydroperiods and water quality Step 3 – Revegetate: revegetate areas no longer needed use donor community soil as a seedbank (alternative) establish wetland species through inoculation or mulching with wetland peats or soils hand-plant species as required	Step 1 – Restore substrate, elevation, and hydroperiod: remove fill material, debris, or other overburden grade to natural contour and elevation replace stockpiled soil or use donor material do not use fertilizer or nutrient-rich soils without prior approval Step 2 – Revegetate: use stockpiled soil (or donor material from like habitat) to provide seed source for prairie revegetation (if stockpiled within past year) seed with native grasses or use sprigs from donor plants plant marsh species as whole plant clumps or by sprigging plant 1-year old cypress seedlings January through March (expect 26% mortality rate) base planting densities on original densities avoid use of fertilizers

Table C-3: Post-Reclamation Monitoring Stipulations

Step 1 – Photographs of the Site	Step 2 – Collection of Hydrologic Data	Step 3 – Field Observation and Report
Take photographs from set points established during the pre-disturbance phase	Collect data monthly for the first 3 years after reclamation Collect and analyze water samples for nutrients, toxins, pH, etc., if reclamation is not succeeding	Keep records of species growth, succession, natural revegetation, and exotic species colonization Divide reclamation site into permanent quadrants (10 meters x 100 meters) Tag planted trees and measure quarterly to gauge success Record tree and plant mortality rates in each quadrant Submit annual report of measured parameters to the Big Cypress superintendent

APPENDIX D: IMPLEMENTATION COSTS

Estimated costs and phasing are listed below. Costs are standard class C estimates; less costly options may be available in many cases.

Table D-1: Proposed Action

Item	Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
	Interpretation			
	Phase 1			
1	Forty Mile Bend entrance and orientation, outdoor exhibit with replacements (requires cooperative agreement with state)	6,550	1,250	7,800
2	Ochopee entrance and orientation outdoor exhibits with replacements	6,550	1,250	7,800
3	New visitor center exhibits (30' x 18' space)	91,700	17,500	109,200
4	Orientation graphic aid or device for the visitor center information desk	3,930	750	4,680
5	Self-guiding publication interpreting the four Loop Road interpretive boardwalks, the East Hinson Marsh boardwalk, and the Kirby Storter boardwalk	6,550	1,250	7,800
	Phase 1 – Subtotal	115,280	22,000	137,280
	Phase 2			
6	Mile-marker 38 orientation exhibit (cooperative agreement with the state)	6,550	1,250	7,800
7	Florida National Scenic Trail hiker register and outdoor exhibit near Oasis visitor center picnic area	6,550	1,250	7,800
8	Self-guiding publication for the visitor center picnic area loop trail (0.5 mi loop trail)	6,550	1,250	7,800
	Phase 2 – Subtotal	19,650	3,750	23,400
	Phase 3			
9	South Florida orientation to NPS areas (videotape, 15 min)	72,050	13,750	85,800
10	Establishment of audiovisual library	78,600	15,000	93,600
11	Self-guiding publication on canal construction within the preserve and associated plants and animals	6,550	1,250	7,800
	Phase 3 – Subtotal	157,200	30,000	187,200
	Interpretation – Total	292,130	55,750	347,880

Item	Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
	Visitor Use Development			
	Phase 1			
12	Forty Mile Bend entrance and orientation pulloff (requires cooperative agreement with the state) 5-7 car parking area no fill	11,790	2,250	14,040
13	Ochopee entrance and orientation pulloff 5-7 car parking area 0.3 acre fill (3' deep)	18,340	3,500	21,840
14	13 developed ORV access points each with parking for 10 cars/trailers each with approximately 0.5 acre fill (1' deep)	1,106,950	211,250	1,318,200
15	1 developed ORV access at Perocchi Grade 30 car/trailer parking area 0.75 acre fill (1' deep)	102,180	19,500	121,680
16	Burns Lake campground rehabilitation 50 sites 1.75-mile road upgrade water well/chlorination well house 2 self-contained comfort stations 0.3 acre fill (2' deep) contour grading	694,300	132,500	826,800
17	Monument Lake campground rehabilitation 50 sites 0.75-mile road upgrade water well/chlorination well house 2 self-contained comfort stations 0.3 acre fill (2' deep) contour grading	596,050	113,750	709,800
18	Dona Drive campground rehabilitation 50 sites 0.5-mile road upgrade water well/chlorination well house 2 self-contained toilets no fill contour grading	589,500	112,500	702,000
19	Bear Island campground rehabilitation 45 sites 1-mile road upgrade water well/chlorination well house 3 self-contained portable toilets 0.5 acre fill (1' deep) general contouring	643,210	122,750	765,960
20	Loop Road; 4 interpretive pulloffs with interpretive trails/boardwalks, each with the following 5-7 car parking 0.5-mile boardwalk, 8' wide, nonskid surface 0.3 acre fill (2' deep) 2 self-contained toilets	2,462,800	470,000	2,932,800

Item	Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
Phase 1 (cont.)				
21	Loop Road trailhead parking 3 car parking 0.1 acre fill (1' deep)	5,240	1,000	6,240
22	Loop Road rehabilitation (20.5 miles) existing 14' wide travel way resurfaced replacement of damaged culverts	2,620,000	500,000	3,120,000
23	Seagrape concession operations site preparation (0.1 acre; no fill) utility hookups	6,550	1,250	7,800
	Phase 1 – Subtotal	8,856,910	1,690,250	10,547,160
Phase 2				
24	Seagrape boat ramp 10 cars/trailers no fill boat ramp	32,750	6,250	39,000
25	Fifty Mile Bend campground rehabilitation 50 sites 0.5-mile road upgrade water well/chlorination well house 2 self-contained toilets 0.3 acre fill (2' deep) contour grading	589,500	112,500	702,000
26	Red Bird Lane campground construction site preparation (clearing 2.5 acres) 45 sites 0.75-mile road upgrade water well/chlorination well house 2 self-contained portable toilets no fill	567,230	108,250	675,480
27	Oasis visitor center borrow canal replace metal guardrail (approx. 60') on north side of canal using aesthetically compatible materials develop a safe, 4' wide observation paved walkway (approx 60') on north side of canal for wildlife viewing landscape walkway from visitor center to canal	13,100	2,500	15,600
28	Oasis visitor center picnic/interpretive boardwalk area develop 6 shaded picnic structures 60' paved pathway from visitor center to picnic area 75' boardwalk adjacent to north side of canal; nonskid surface replace 150' section of existing metal guardrail on south side of canal with more aesthetically pleasing materials develop 0.5-mile interpretive boardwalk loop trail near picnic area	1,034,900	197,500	1,232,400

Item	Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
	Phase 2 (cont.)			
29	Florida National Scenic Trail relocation at Oasis abandon approx. 1 mile of existing hiking trail on west side of visitor center; revegetate develop 1 mile of new hiking trail on east side of visitor center, with trailhead upgrade pistol range to protect hikers after trail is relocated	32,750	6,250	39,000
30	Kirby Storter boardwalk extension (cooperative agreement with state) 500' boardwalk, 8' wide, nonskid surface	157,200	30,000	187,200
31	East Hinson Marsh interpretive trail/boardwalk 5-7 car parking 0.5-mile boardwalk, 8' wide, nonskid surface no fill	795,170	151,750	946,920
32	Pattons concession operation site preparation (3 acres) 0.5 acre fill (1' deep) utility hookups 6 backcountry shelters	162,440	31,000	193,440
33	Parkwide signing units where ORVs are on designated trails new preservewide information and directional signs	413,960	79,000	492,960
34	Pinecrest ranger station rehabilitation of shop structure and two structures for housing	19,650	3,750	23,400
35	Bear Island ranger station mobile trailer site preparation 3,000' waterline (campground to ranger station) electric generator	176,850	33,750	210,600
	Phase 2 – Subtotal	3,995,500	762,500	4,758,000
	Phase 3			
36	Turner River canoe parking and put-in 8 cars 2 cars/trailers 0.75 acre fill (2' deep) Shaded picnic chickee – 200 sq ft (pole support over water)	77,290	14,750	92,040
37	Trail Center canoe parking and put-in 8 cars 2 cars/trailers 0.3 acre fill (1' deep) new canal culvert	69,430	13,250	82,680
38	Forty Mile Bend canoe parking and put-in (cooperative agreement with state) 8 cars 2 cars/trailers no fill	55,020	10,500	65,520
	Phase 3 – Subtotal	201,740	38,500	240,240
	Development – Total	**13,054,150**	**2,491,250**	**15,545,400**

Item	Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
Housing				
Ochopee				
Phase 1				
39	Repair 7 existing single-family homes	82,530	15,750	98,280
40	Repair newly acquired private residence and use for single-family home	13,100	2,500	15,600
41	Convert a portion of the lodge to provide 25 apartments	510,900	97,500	608,400
	Phase 1 – Subtotal	606,530	115,750	722,280
Phase 2				
42	Convert present administration building to single-family home	13,100	2,500	15,600
Phase 3				
43	Construct 4 new single-family homes	471,600	90,000	561,600
	Ochopee – Subtotal	1,091,230	208,250	1,299,480
Oasis				
Phase 1				
44	Construct 2 single-family homes	157,200	30,000	187,200
45	Construct duplex bunkhouse	157,200	30,000	187,200
	Phase 1 – Subtotal	314,400	60,000	374,400
Phase 3				
46	Remove 8 existing houses	52,400	10,000	62,400
	Oasis – Subtotal	366,800	70,000	436,800
	Housing – Total	**1,458,030**	**278,250**	**1,736,280**
Maintenance and Operations Facilities				
Ochopee				
Phase 1				
47	Remodel interior of Big Cypress Lodge A wing (4,100 sq ft) and B wing (2,200 sq ft) – offices, laboratory, visitor contact, and other administrative functions	301,300	57,500	358,800

Item	Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
	Phase 2 – Ochopee			
48	Construct new maintenance area:			
48a	Electrical and carpentry shop with storage and locker room (2,000 sq ft)	262,000	50,000	312,000
48b	Equipment and vehicle covered storage (2,000 sq ft)	52,400	10,000	62,400
48c	Flammable materials storage (200 sq ft)	26,200	5,000	31,200
48d	Chain link fence (400 lin ft)	7,860	1,500	9,360
48e	Pavement (10,00 sq ft)	30,130	5,750	35,880
	Subtotal	378,590	72,250	450,840
	Ochopee – Subtotal	679,890	129,750	809,640
	Oasis			
	Phase 3			
49	Pave and light Oasis airstrip	550,200	105,000	655,200
50	Construct helicopter pad and hangar with pilot office and equipment storage (2,300 sq ft)	117,900	22,500	140,400
51	Move aviation fuel station to hangar area	26,200	5,000	31,200
52	Construct new maintenance area:			
52a	Vehicle and equipment repair shop with storage and locker room (3,500 sq ft)	458,500	87,500	546,000
52b	Covered vehicle storage (3,000 sq ft)	78,600	15,000	93,600
52c	Covered materials storage (1,000 sq ft)	26,200	5,000	31,200
52d	Flammable materials storage (200 sq ft)	26,200	5,000	31,200
52e	Pesticide storage and handling building (400 sq ft)	52,400	10,000	62,400
52f	Vehicle and equipment cleaning facility (200 sq ft)	13,100	2,500	15,600
52g	Chain link fence (1,200')	23,580	4,500	28,080
52h	Pavement (1 acre)	128,380	24,500	152,880
52i	Pave Oasis service roads	294,750	56,250	351,000
52j	Remodel interior of northeastern portion of Oasis ranger station for fire cache	65,500	12,500	78,000
	Oasis – Subtotal	1,861,510	355,250	2,216,760
	Maintenance and Operations Facilities – Total	**2,541,400**	**485,000**	**3,026,400**
	Utilities			
	Ochopee			
	Phase 2			
53	Sewer system modification	153,270	29,250	182,520
	Phase 3			
54	Connection with Everglades City water supply (extension line and storage)	458,500	87,500	546,000
	Subtotal – Ochopee	611,770	116,750	728,520

Item	Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
	Oasis			
	Phase 1			
55	Construction of new septic systems for 2 new single-family homes and 1 new duplex	26,200	5,000	31,200
	Phase 2			
56	Utility connection for new maintenance shop	13,100	2,500	15,600
	Phase 3			
57	Connection of new helicopter hangar to water, electric, and telephone lines and septic tank installation	170,300	32,500	202,800
	Subtotal – Oasis	209,600	40,000	249,600
	Utilities – Total	**821,370**	**156,750**	**978,120**
	Natural Resource Management			
	Phase 1			
58	Comprehensive ecological study of the Florida panther and its prey base			300,000
59	Turner River/Deep Lake Strand restoration (5 years)			150,000
60	Water quality monitoring (1 year)			100,000
61	Melaleuca control (2 years)			200,000
	Subtotal – Phase 1			750,000
	Phase 2			
62	Study of effects of managed fires (3 years)			300,000
63	Wildlife management plan (2 years)			100,000
64	Feral hog impact study (3 years)			120,000
	Subtotal – Phase 2			520,000
	Phase 3			
65	Restoration of abandoned fill sites (3 years)			300,000
66	Brazilian pepper control			150,000
	Subtotal – Phase 3			450,000
	Natural Resource Management – Total			**1,720,000**

Appendix D

Summary – Proposed Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
Interpretation			
Phase 1	115,280	22,000	137,280
Phase 2	19,650	3,750	23,400
Phase 3	157,200	30,000	187,200
Interpretation – Total	292,130	55,750	347,880
Visitor Use Development			
Phase 1	8,856,910	1,690,250	10,547,160
Phase 2	3,995,500	762,500	4,758,000
Phase 3	201,740	38,500	240,240
Visitor Use Development – Total	13,054,150	2,491,250	15,545,400
Housing			
Ochopee			
Phase 1	606,530	115,750	722,280
Phase 2	13,100	2,500	15,600
Phase 3	471,600	90,000	561,600
Ochopee – Subtotal	1,091,230	208,250	1,299,480
Oasis			
Phase 1	314,400	60,000	374,400
Phase 3	52,400	10,000	62,400
Oasis – Subtotal	366,800	70,000	436,800
Housing – Total	1,458,030	278,250	1,736,280
Maintenance and Operations			
Ochopee			
Phase 1	301,300	57,500	358,800
Phase 2	378,590	72,250	450,840
Ochopee – Subtotal	679,890	129,750	809,640
Oasis			
Phase 3	1,861,510	355,250	2,216,760
Maintenance and Operations – Total	2,541,400	485,000	3,026,400
Utilities			
Ochopee			
Phase 2	153,270	29,250	182,520
Phase 3	458,500	87,500	546,000
Ochopee – Subtotal	611,770	116,750	728,520
Oasis			
Phase 1	26,200	5,000	31,200
Phase 2	13,100	2,500	15,600
Phase 3	170,300	32,500	202,800
Oasis – Subtotal	209,600	40,000	249,600
Utilities – Total	821,370	156,750	978,120
Natural Resource Management			
Phase 1			750,000
Phase 2			520,000
Phase 3			450,000
Natural Resource Management – Total			1,720,000
Proposed Action – Grand Total	18,167,080	3,467,000	23,354,080

Table D–2: Alternative A

Action	Gross Cost	Advance and Project Planning Cost	Total Project Cost
Interpretation			
Same as proposed action item 1	6,550	1,250	7,800
Same as proposed action item 2	6,550	1,250	7,800
Same as proposed action item 3	91,700	17,500	109,200
Same as proposed action item 4	3,930	750	4,680
Same as proposed action item 5	6,550	1,250	7,800
Orientation exhibit at Cypress Lane	6,550	1,250	7,800
Florida National Scenic Trail – trailhead and exhibit near Ochopee	6,550	1,250	7,800
Same as proposed action item 8	6,550	1,250	7,800
Same as proposed action item 9	72,050	13,750	85,800
Same as proposed action item 10	78,600	15,000	93,600
Same as proposed action item 11	6,550	1,250	7,800
Interpretation – Total	**292,130**	**55,750**	**347,880**
Visitor Use Development			
Same as proposed action item 12	11,790	2,250	14,040
Same as proposed action item 13	18,340	3,500	21,840
14 developed ORV access points each with parking for 10 cars/trailers each with approx. 0.5 acre of fill (1' deep)	1,192,100	227,500	1,419,600
2 developed ORV access points (1 near Bear Island campground and 1 near boundary on Bear Island Road), each with parking for 15 cars/trailers; no fill	104,800	20,000	124,800
Same as proposed action item 16	694,300	132,500	826,800
Same as proposed action item 17	596,050	113,750	709,800
Midway Lake campground (same actions as proposed action item 18)	589,500	112,500	702,000
Same as proposed action item 19	643,210	122,750	765,960
Same as proposed action item 20	2,462,800	470,000	2,932,800
Same as proposed action item 21	5,240	1,000	6,240
Loop Road reconstruction new 20' wide road, 2'-3' shoulders culverts and bridges 268,600 cu yd of fill	13,100,000	2,500,000	15,600,000
Same as proposed action item 23	6,550	1,250	7,800
Same as proposed action item 24	32,750	6,250	39,000
Same as proposed action item 25	589,500	112,500	702,000
Same as proposed action item 26	567,230	108,250	675,480
Same as proposed action item 27	13,100	2,500	15,600
Same as proposed action item 28	1,034,900	197,500	1,232,400
Reroute Florida National Scenic Trail to Ochopee (about 30 miles of new trail); retain existing segment to Loop Road as side trail	982,500	187,500	1,170,000
Same as proposed action item 30	157,200	30,000	187,200
Same as proposed action item 31	795,170	151,750	946,920
Same as proposed action item 32	162,440	31,000	193,440
Same as proposed action item 33	413,960	79,000	492,960
Same as proposed action item 34	19,650	3,750	23,400
Same as proposed action item 35	176,850	33,750	210,600
Same as proposed action item 36	77,290	14,750	92,040
Same as proposed action item 37	69,430	13,250	82,680
Same as proposed action item 38	55,020	10,500	65,520
1 developed ORV access point and staging area at Cypress Lane and I-75 50 car/trailer parking area upgrade Cypress Lane 48,500 cu yd of fill	400,860	76,500	477,360

Appendix D

Action	**Gross Cost**	**Advance and Project Planning Cost**	**Total Project Cost**
Visitor Use Development (cont.)			
Upgrade Bear Island Road / Perocchi	2,620,000	500,000	3,120,000
Grade for street-legal vehicles			
5.8 miles of 18' road			
23,000 cu yd of fill			
Construct group campground near Pinecrest	148,030	28,250	176,280
15 sites			
self-contained toilets			
Visitor Use Development – Total	**27,740,560**	**5,294,000**	**33,034,560**
Housing			
Same as proposed action item 39	82,530	15,750	98,280
Same as proposed action item 40	13,100	2,500	15,600
Same as proposed action item 41	510,900	97,500	608,400
Same as proposed action item 42	13,100	2,500	15,600
Same as proposed action item 43	471,600	90,000	561,600
Construct 6 single-family residences at Oasis	471,600	90,000	561,600
Same as proposed action item 45	157,200	30,000	187,200
Same as proposed action item 46	52,400	10,000	62,400
Housing Total	**1,772,430**	**338,250**	**2,110,680**
Maintenance and Operations Facilities			
Same as proposed action items 47-52j	2,541,400	485,000	3,026,400
Utilities			
Same as proposed action items 53-57	821,370	156,750	978,120
Natural Resource Management			
Same as proposed action items 58-66			1,720,000
Alternative A – Grand Total	**33,167,890**	**6,329,750**	**41,217,640**

Table D–3: Alternative B

Action	Gross Cost	Advanced and Project Planning Cost	Total Project Cost
Interpretation			
Same as proposed action item 1	6,550	1,250	7,800
Same as proposed action item 2	6,550	1,250	7,800
Same as proposed action item 3	91,700	17,500	109,200
Same as proposed action item 4	3,930	750	4,680
Same as proposed action item 6	6,550	1,250	7,800
Same as proposed action item 7	6,550	1,250	7,800
Same as proposed action item 8	6,550	1,250	7,800
Same as proposed action item 9	72,050	13,750	85,800
Same as proposed action item 10	78,600	15,000	93,600
Interpretation – Subtotal	**279,030**	**53,250**	**332,280**
Visitor Use Development			
Same as proposed action item 12	11,790	2,250	14,040
Same as proposed action item 13	18,340	3,500	21,840
13 developed ORV access points 20 car/trailer parking area 17,500 cu yd of fill total	1,447,550	276,250	1,723,800
Same as proposed action item 16	694,300	132,500	826,800
Same as proposed action item 17	596,050	113,750	709,800
Same as proposed action item 19	643,210	122,750	765,960
Same as proposed action item 21	5,240	1,000	6,240
Same as proposed action item 22	2,620,000	500,000	3,120,000
Same as proposed action item 26	567,230	108,250	675,480
Same as proposed action item 28	1,034,900	197,500	1,232,400
Same as proposed action item 29	32,750	6,250	39,000
Same as proposed action item 33	413,960	79,000	492,960
Visitor Use Development – Total	**8,085,320**	**1,543,000**	**9,628,320**
Housing			
Ochopee – all facilities removed and site reclaimed	131,000	25,000	156,000
Oasis			
construct 7 single-family residences	117,900	22,500	140,400
construct 7-unit townhouse	458,500	87,500	546,000
construct apartments – 30 units	1,572,000	300,000	1,872,000
Same as proposed action item 46	52,400	10,000	62,400
Housing – Total	**2,331,800**	**445,000**	**2,776,800**
Maintenance and Operations Facilities			
Ochopee – same as proposed action items 48a, b	314,400	60,000	374,400
Oasis			
Same as proposed action items 49-52j	1,861,510	355,250	2,216,760
Remodel interior of northern portion of Oasis ranger station for administrative offices (6,100 sq ft)	280,340	53,500	333,840
Construct new fire cache and vehicle and equipment storage building (6,000 sq ft)	393,000	75,000	468,000
Maintenance and Operations Facilities – Total	**2,849,250**	**543,750**	**3,393,000**
Utilities			
Construct new sewage system for Oasis	1,310,000	250,000	1,560,000
Natural Resource Management			
Same as proposed action items 58-66	—	—	1,720,000
Alternative B – Grand Total	**14,855,400**	**2,835,000**	**19,436,920**

APPENDIX E: BIG CYPRESS NATIONAL PRESERVE – ROAD EVALUATION

	EXISTING CONDITIONS								PROPOSED CONDITIONS					
Route Name	**Length (miles)**	**Current Function**	**Est. ADT**	**Special Conditions**	**Travel Way/ Shoulder Width**	**Avg. Fill Width**	**Current Surface**	**Posted Speed**	**Class**	**Proposed Function**	**Travel Way/ Shoulder Width**	**New Fill Width**	**Proposed Surface**	**Comments**
Red Bird Lane	0.5	Private access and access to airboat landing	5	Road crosses improved property	14/0	16	gravel	NA	III	Campground access and airboat launch site	18/1	24	paved	
Forty Mile Bend parking area – east entrance to preserve	NA	Informal parking for boat launching and fishing	—	Within right-of-way owned by Florida DOT	NA		gravel	NA	III	Preserve orientation and canoe launching		0	paved	
Trail Center canoe put-in	NA	Nonexistent	—		NA	NA	NA	NA	III	Canoe launching	18/1		paved	3,000 cu yds fill required; culvert over Tamiami Canal, acceleration/deceleration lanes needed
Fifty Mile Bend campground road	0.5	Access to campground	40		12-14/0	entire area filled	gravel	NA	III	Campground access and circulation; ORV access	18/1 and 14/1	0	paved	Roadwork associated with upgrading campground; 1,600 cu yds fill needed for ORV access; no new filling of wetlands; site leveling needed; road does not provide access to improved properties; replace culverting for Tamiami Canal
Dona Drive campground road	0.5	Access to campground, with paved parking area at entrance	40	No new fill required;	19/1 and 14/0	entire area filled	pavement, gravel	NA	III	Campground access and circulation	18/1 and 14/1	0	paved	No new filling of wetlands; site leveling needed; road does not provide access to improved properties
Pattons	0.25	Access to borrow pit	0	Existing primitive road closed to public	12/0	14	gravel	NA	III	Access to concession-operated tours and ORV access point	18/1	24	paved	Deceleration lane
Oasis	0.5	Internal circulation roads	5		16/0	entire area filled	gravel	NA	V	Circulation for operations center	20/0	0	paved	
	NA	Public parking, 1,500 sq yds	75	Parking for visitor center, Florida Trail hikers, ORV trailers, and picnicking		entire area filled	paved	NA	III	Same as current use	2,200 sq yds	0	paved	Expand existing parking
Loop Road – 4 interpretive wayside pullouts	NA	Nonexistent	—		—	—	—	—	III	Access and parking for wayside exhibits and interpretive trails	5-7 car parking area		paved	3 pullouts require 3,000 cu yds fill each; 1 requires culverting of canal
Monument Lake campground road	0.5	Campground access and circulation; ORV access point	40		14/0	16	gravel	NA	III	Campground access and circulation; ORV access	18/1 and 14/1		paved	Acceleration/deceleration lanes may be needed; 1,600 cu yds of fill for ORV access; may require new culvert crossing of Tamiami Canal
Burns Lake campground road	1.5	Campground access and circulation	40		19/1	25	paved	25	III	Campground access and circulation	19/1 and 14/1	0	paved	No new filling of wetlands; some fill for roads possible; site-leveling needed; this road does not provide access to improved properties; new culvert crossing of Tamiami Trail

EXISTING CONDITIONS									PROPOSED CONDITIONS					
Route Name	**Length (Miles)**	**Current Function**	**Est. ADT**	**Special Conditions**	**Travel Way/ Shoulder Width**	**Avg. Fill Width**	**Current Surface**	**Posted Speed**	**Class**	**Proposed Function**	**Travel Way/ Shoulder Width**	**New Fill Width**	**Proposed Surface**	**Comments**
Turner River Canal canoe put-in	0.25	Canoe put-in			—	—	—	—	III	Access for canoe launching and picnicking	18/1		paved	Much of site is in second-growth pine lands; some filling of wetlands necessary for access road only; acceleration/deceleration lanes needed
Dona Drive	0.5	Access to NPS residences and public airboat launching	5		20/1	entire area filled	paved	NA	III	Access to airboat launching site	20/1	0	paved	No new filling required; some site grading may be needed
Ochopee administrative/ residential area roads and parking areas	1.5	Residential/administrative area circulation	40	No new construction needed	20/1	entire area filled	paved	NA	V	Same as current use	20/1	0	paved	Upgrade/redesign of of entrance road needed to improve traffic flow; resurfacing needed
		Public parking for visitor contact station, approx. 1,500 sq yds	50			entire area filled	paved	NA	III	Same as current use; expand			paved	Approx. 1,500 sq yds of new parking space; some redesign/resurfacing of existing parking may be needed
Seagrape Drive	0.75	Access to improved properties and boat launching site	25		20/1	entire area on fill	paved	NA	III	Access to boat launching site	20.1	0	paved	Resurfacing and some grading necessary; boat ramp installation
West entrance parking area	—	Nonexistent; site will be on US 41	—	Wetlands	—	—	—	—	III	Parking for visitor orientation exhibit	parking for 5-7		paved	<3,000 cu yds of fill required in marsh
East Hinson Marsh interpretive wayside parking area	0.1	Abandoned road segment	0		—	entire site on fill	—	—	III	Parking for interpretive wayside and trail	parking for 5-7 cars		paved	
Bear Island campground road	1.0	Access and circulation in campground and ORV access point	20	Filling in disturbed area may be necessary	12/0	14	dirt	NA	III	Campground access and circulation and ORV access point	18/1		paved	Most of site is on upland second-growth pinelands; road may be used for oil access in addition to visitor use
7 ORV access points (County Line Trail, Sawdust Trail, Sig Walker Landing, Burns Lake, Georges, Concho Billy Trail, Airplane Prairie)		Unimproved ORV access points	—	Wetlands	—	—	—	—	III	ORV access and staging areas	parking for 5-10 cars and trailers		paved	Some filling in wetlands may be necessary; up to 17,500 cu yds of fill needed; 5 sites require culvert crossing of canals; special design for US 41 road shoulder parking areas
Bass Lake Road	1.25	Access to NPS housing	5	To be removed	16/0	20	paved	NA	—		—	—	—	Remove road when housing is removed
Cypress Lane	1.5	Access to improved properties	3	To be removed	16/0	20	paved	NA	—		—	—	—	Road removal is proposed by state as part of construction of I-75

APPENDIX F: COMPLIANCE STATUS

Documentation of compliance by the National Park Service with federal and state laws and regulations is incorporated within the text of this *Draft General Management Plan / Draft Environmental Impact Statement*. However, the compliance status of 10 federal laws, executive orders, and regulations, along with associated state regulations, are summarized here for clarity and convenience.

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

The *Draft General Management Plan / Draft Environmental Impact Statement* provides public disclosure of the planning and decision-making process and the potential environmental consequences of actions and alternatives, as required by the National Environmental Policy Act. The draft document will be available for public review for 90 days. Agency and public comments will then be considered; the draft plan and environmental analysis will be reviewed in light of the comments; and a final general management plan and environmental impact statement will be published and will respond, either individually or through summaries, to all substantive comments received. Thirty days following publication of the final plan and environmental impact statement, a record of decision will be published to document the final decision and the alternatives considered, to identify the environmentally preferable alternative, and to describe whether all practicable means of avoiding environmental harm as a result of implementing the selected action have been adopted. At that time the actions in the final plan will be implemented.

Plans of operations for the development of oil and gas resources within Big Cypress National Preserve, and their accompanying environmental analyses, are made available for at least a 60-day public review and comment period, following an announcement in the *Federal Register*.

ENDANGERED SPECIES ACT OF 1973

Section 7 of the Endangered Species Act directs all federal agencies to utilize their authorities in furtherance of the purposes of the act by carrying out programs for the conservation of endangered or threatened species. Federal agencies are required to consult with the U.S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitat.

Informal consultation under section 7 of the Endangered Species Act was initiated with the U.S. Fish and Wildlife Service (USFWS) in April 1985 with a request for a list of species potentially within the project area. Through subsequent correspondence and meetings with USFWS personnel, a list of 10 endangered species, three threatened species, and 25 species under consideration for federal listing was generated. These species are shown in tables 20 and 22 of the document. There is no designated critical habitat within Big Cypress National Preserve for any federally listed species.

It is the conclusion of the National Park Service that the draft proposed action described in this document would not jeopardize any federally listed or candidate species or critical habitat and may beneficially affect the endangered Florida Panther (see discussions in "Environmental Consequences").

Prior to authorization of a final general management plan, a biological assessment will be prepared for the selected management actions and submitted to the U.S. Fish and Wildlife Service for review.

All oil and gas operators who are preparing plans of operations must informally and, if needed, formally consult with the U.S. Fish and Wildlife Service before the plan of operations can b approved (see the minerals management plan in appendix C).

EXECUTIVE ORDER 11988 ("FLOODPLAIN MANAGEMENT") AND EXECUTIVE ORDER 11990 ("PROTECTION OF WETLANDS")

Executive Orders 11988 ("Floodplains Management") and 11990 ("Protection of Wetlands") direct federal agencies to enhance floodplain and wetland values, to avoid development in floodplains and wetlands whenever there is a practicable alternative, and to avoid to the extent possible adverse impacts associated with the occupancy or modification of floodplains and wetlands.

Under the proposed action the restoration of the Turner River/Deep Lake Strand drainage and the improvement of water flow under the Loop Road would enhance wetland values. More natural hydroperiods would be reestablished on as much as 3,000 acres in the Turner River/Deep Lake strand drainage (NPS, Rose et al. 1981a) and on an estimated 28,000 acres north and south of the Loop Road. Depending on the recommendations of future studies, water flow between Okaloacoochee Slough and East Hinson Marsh could be improved, thus restoring hydroperiods to as much as 7,000 acres along the Bear Island Road.

Reducing the number of ORV trails in or through important resource areas under the proposed action would allow the natural rehabilitation of approximately 170 acres of marsh, cypress strands, and mixed-hardwood swamps. The reduction in the number of trails through prairies and cypress prairies would be somewhat less. Approximately 1,800 acres of wetlands would continue to be affected by ORV trails. A network of trails would be maintained to provide adequate recreational access to wetland resources.

Any further modification or occupation of floodplains or wetlands as a result of NPS administrative or operational developments would be avoided. However, proposed visitor use facilities such as ORV access points, interpretive pullouts, and canoe-launching facilities would require filling a total of approximately 7 acres of wetlands. There are no alternatives to locating these facilities within wetlands because wetlands are the dominant landform in Big Cypress and are integral to the interpretive and recreational experience. The adverse effects of filling would be mitigated to some extent by the removal of existing spoil and fill materials in other locations in the preserve. Proposed facilities and interpretive programs would enhance the public enjoyment and understanding of wetland values.

As described under "Affected Environment," the Ochopee administrative/residential area and the proposed campground at Dona Drive are within the 100-year floodplain. The existing filled land (approximately 104 acres) would continue to be occupied under the proposed plan, and new residences and other facilities would be constructed on the site. New facilities would be built in accordance with requirements in the "Floodplain Management Criteria for Flood-Prone Areas" (44 CFR 60.3). Ten existing residences in the vicinity of Ochopee that are within the 100-year floodplain would be removed. To minimize flood hazards to visitors and employees, the National Park Service would continue to maintain and implement a hurricane preparedness plane. A statement of findings documenting the effects of the proposed plan on floodplains and wetlands, and the rationale for continued occupation of the 100-year floodplain, will accompany the final environmental impact statement, as required by NPS guidelines for compliance with Executive Orders 11988 and 11990.

New facility construction and park operations would have little effect on water quality. NPS fill operations will comply with the requirements of section 404 of the Federal Water Pollution Control Act, section 10 of the Rivers and Harbors Act, chapters 17-3 and 17-4 of the Florida Administrative Code, and other applicable regulations. Turbidity during construction would be limited by silt screens or other methods; the worst effect would be temporary localized siltation. Parking areas and other developed sites would be designed to allow storm water to percolate into the soil rather than running off directly into adjacent wetlands, thus helping to protect water quality in these localized areas. Operation of NPS sewage treatment and solid waste disposal systems will continue to comply with federal and state regulations to avoid pollution of adjacent surface water or groundwater resources. Sewage disposal at most proposed campgrounds, parking areas, and other visitor use facilities would be by means of a pump-out vault, and sewage would be trucked out of the preserve for treatment.

The development of oil and gas resources within the preserve would occur in most cases in wetlands and within the floodplain. Proposed plans of operations will be reviewed on a case-by-case basis to ensure compliance with the provisions of Executive Orders 11988 and 11990 (see the minerals management plan in appendix C).

COASTAL ZONE MANAGEMENT

The National Park Service has informally consulted with the Florida Department of Environmental Regulation about the state's coastal zone management program. The state's primary concerns are (1) the protection of surface waters and wetlands, (2) the protection of mangrove forests, and (3) the protection of endangered species. Based on this contact, and a review of the state program, the National Park Service believes that the *Draft General Management Plan / Draft Environmental Impact Statement* addresses these concerns.

The Park Service will review the final general management plan to ensure consistency with the state designations for outstanding Florida waters and areas of critical state concern, the Big Cypress Conservation Act of 1975, and the state's coastal zone management program. A formal consistency determination will then be submitted to the state, in accordance with the 1972 Coastal Zone Management Act, as amended, and its implementing regulations (15 CFR 930).

COUNCIL ON ENVIRONMENTAL QUALITY MEMORANDUM ON PRIME OR UNIQUE FARMLAND SOILS

An August 11, 1980, memorandum from the Council on Environmental Quality requires federal agencies to assess the effects of their actions on soils classified by the Soil Conservation Service as prime or unique farmlands. The Soil Conservation Service state soil scientist reports that no such soils occur within the preserve; consequently, there would be no impact.

NATIONAL HISTORIC PRESERVATION ACT OF 1966

As required by section 106 of the National Historic Preservation Act, the *Draft General Management Plan / Draft Environmental Impact Statement* is being reviewed by the state historic preservation officer and the Advisory Council on Historic Preservation, in accordance with the council's regulations (36 CFR 800). Comments of the state historic preservation officer on the review draft have been incorporated. The state historic preservation officer is also given copies of proposed plans of operations for oil and gas development and the subsequent environmental analyses for review and comment.

Historic structures were evaluated in accordance with section 110 of the National Historic Preservation Act to determine their eligibility for inclusion on the National Register of Historic Places. Only the Monroe Station and the Tamiami Trail appeared to have any of the qualities that might make them eligible for inclusion on the National Register. Upon further evaluation, the National Park Service and the state historic preservation officer concurred that the integrity of both had been compromised and that they did not meet National Register criteria (letter of March 9, 1988, from the Florida state historic preservation officer). Archeological sites within Big Cypress have been inventoried by the Southeast Archeological Center. Of 395 sites identified, only six did not appear to have national, state, or local significance. However, consultation with the Florida state historic preservation officer regarding National Register eligibility for the remaining sites is still needed.

As stated in the minerals management plan (see appendix C), all plans of operations for oil and gas development will be reviewed to ensure their compliance with the provisions of the National Historic Preservation Act.

ARCHEOLOGICAL RESOURCES PROTECTION ACT OF 1979

The National Park Service intends to meet its obligations under the Archeological Resources Protection Act. No archeological resources will be excavated without proper permits. Unauthorized excavation, removal, damage, alteration, or defacement of archeological resources will be prosecuted. All archeological resource collections and data will be preserved. Archeological site data will remain confidential. In addition the National Park Service will prosecute "any person who willfully and knowingly disturbs an unmarked burial or burial site, or destroys, mutilates, defaces, injures, or removes any burial mound, earthen or shell monument containing human skeletal remains or associated burial artifacts or other structures or things placed or designed for a memorial, or disturbs the contents of tomb or grave," in accordance with chapter 872 of the Florida Statutes ("Offenses Concerning Dead Bodies and Graves").

All oil and gas operators are required, as part of their permit, to comply with the provisions of the Archeological Resources Protection Act. Any violation of the act will result in the suspension and possible revocation of their authorization to continue operations within the preserve.

EXECUTIVE ORDER 11593 ("PROTECTION AND ENHANCEMENT OF THE CULTURAL ENVIRONMENT")

The Southeast Archeological Center has inventoried both historic and cultural resources within Big Cypress. However, due to the nature of the preserve, it is unlikely that all sites were identified. Therefore, any actions that could affect archeological resources must be cleared by an archeologist to ensure that such resources are not inadvertently damaged or destroyed. All sites will be evaluated in consultation with the state historic preservation officer to determine their eligibility for listing on the National Register of Historic Places.

All oil and gas operators will be required to conduct a site survey of the proposed area of operations for cultural resources. The results of this survey will then be incorporated into the environmental analysis of the plan of operations.

AMERICAN INDIAN RELIGIOUS FREEDOM ACT OF 1978

In accordance with the American Indian Religious Freedom Act (PL 95-341) and with the "Native American Relationships Management Policy of the National Park Service" (52 FR 35674), the National Park Service has identified the relevant native American groups who use the preserve, and as described in the "Consultation and Coordination" section, consultations for the development of use and occupancy regulations are ongoing. As noted in the planning objectives and proposed action sections of this document, the National Park Service as a matter of policy will be as unrestrictive as possible in permitting native American access to and use of traditional sacred resources for traditional ceremonials. The National Park Service will continue to protect the Miccosukee ceremonial and habitation sites that are within the preserve and to provide access in accordance with the American Indian Religious Freedom Act. It is the intent of the National Park Service to establish and promote good relations with the Miccosukee and Seminole inhabitants and neighbors of Big Cypress National Preserve.

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ABBREVIATIONS:

AAPG	American Association of Petroleum Geologists
FGFWFC	Florida Game and Fresh Water Fish Commission
NPS	National Park Service
USFWS	U. S. Fish and Wildlife Service

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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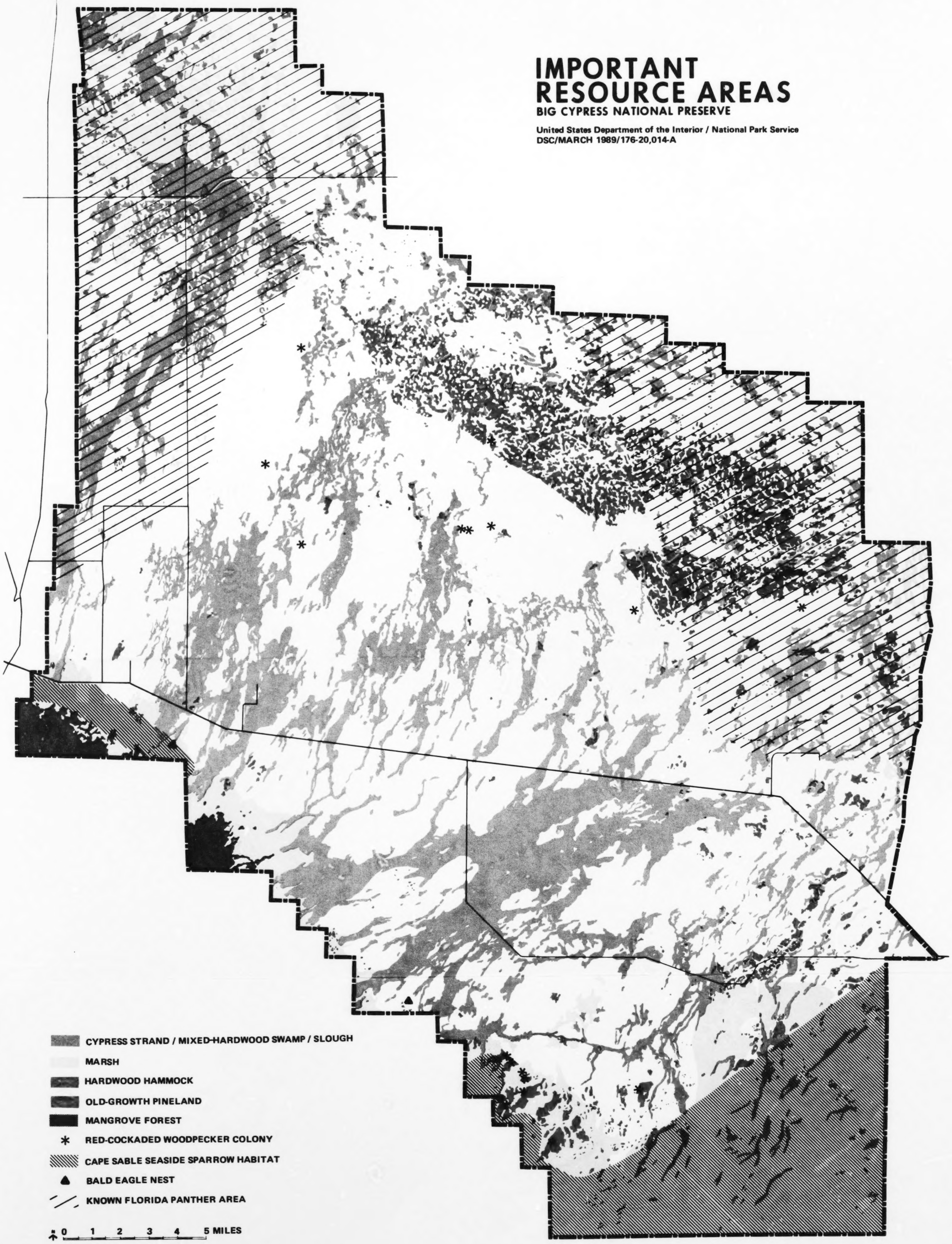
NPS D-54 July 1989

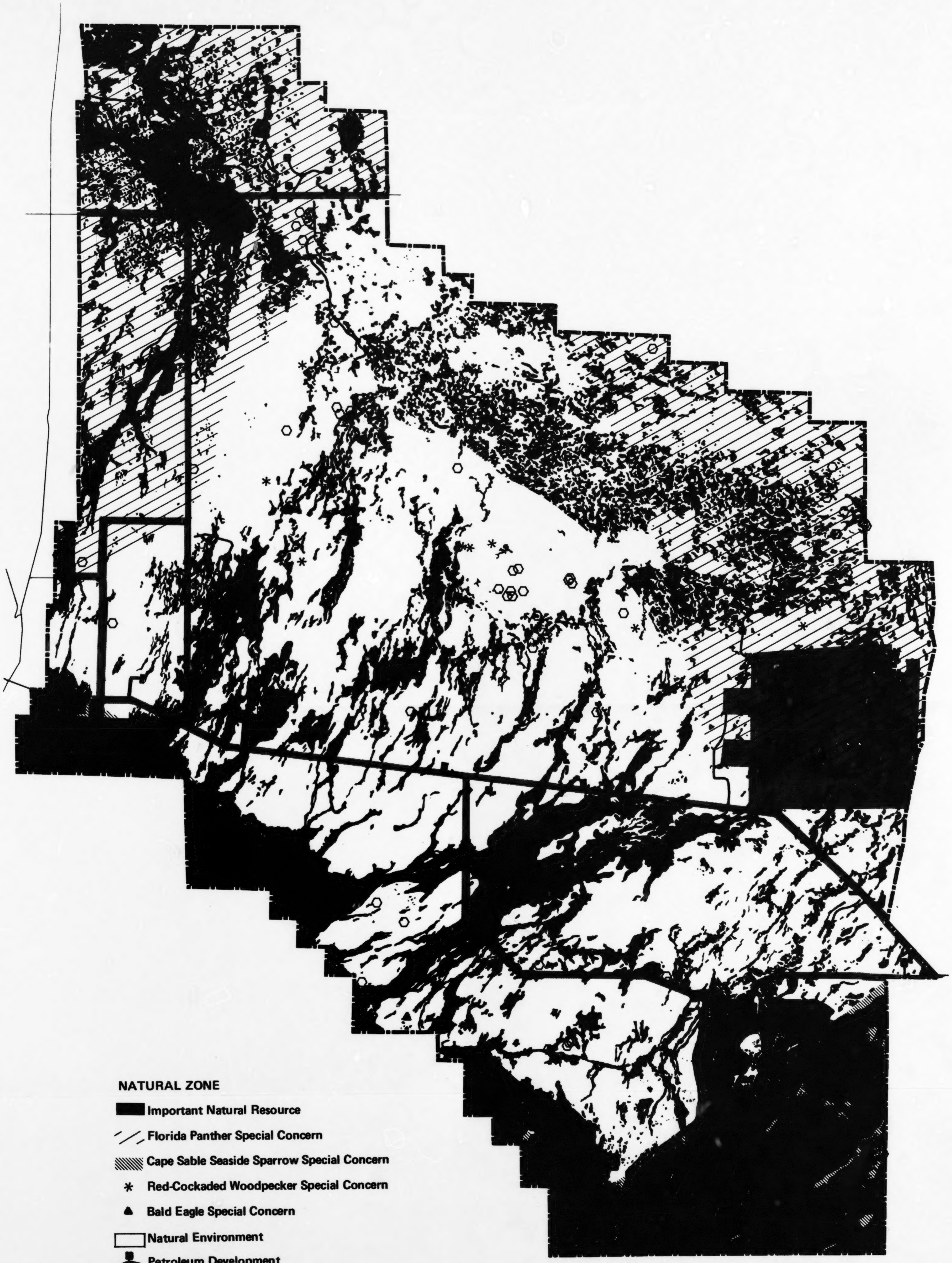
IMPORTANT RESOURCE AREAS
BIG CYPRESS NATIONAL PRESERVE

United States Department of the Interior / National Park Service
DSC/MARCH 1989/176-20,014-A



CYPRESS STRAND / MIXED-HARDWOOD SWAMP / SLOUGH
MARSH
HARDWOOD HAMMOCK
OLD-GROWTH PINELAND
MANGROVE FOREST
* RED-COCKADED WOODPECKER COLONY
CAPE SABLE SEASIDE SPARROW HABITAT
▲ BALD EAGLE NEST
KNOWN FLORIDA PANTHER AREA
N
0 1 2 3 4 5 MILES

NOTE: CULTURAL AND ARCHEOLOGICAL SITES NOT SHOWN



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